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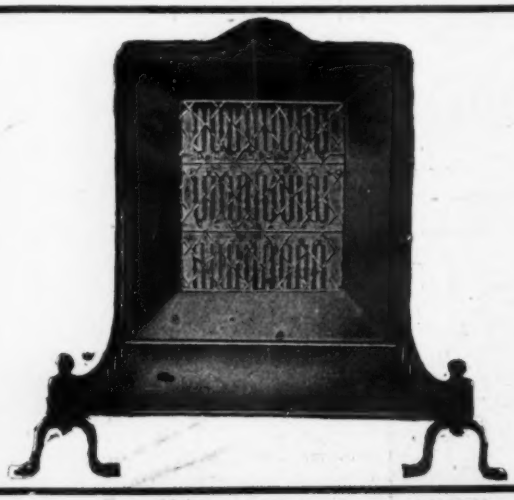

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ELECTRICAL REVIEW.

VOL. LXXXIX. NOVEMBER 4, 1921. No. 2,293.

ELECTRICAL REVIEW.

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AN IMPROVING SITUATION.

THERE seem to be good reasons for hopefulness with regard to the situation as now developing.

Whether we consider the result of the ballot of the federated engineering trade workers, who voted by a majority of 22,835 agreeing to the withdrawal of the bonus in three stages, thus avoiding a stoppage of the industry and facilitating a return to economic production; or if we pay regard to the united determination in the electrical industry whereunder employers and employed will give a new impetus to electrical progress; or whether we note the attention that is being given to the railway electrification schemes which might make so much legitimate and productive work for British factories and British employés if they were put through now, as they may be, under the Government financial aid measures; or, again, whether we note the substantial operations that may soon emerge from the deliberations of the Electricity Commissioners; whether we think of the growing acknowledgement of the greater safety of British industry if it be left to work out its own salvation and is not "controlled" by the State save in respect of very special points, and the consequent feeling of confidence in the stability of capital; or if we give heed to the result of the vote of censure in Parliament and the stability that may be supposed to exist in that direction—all these things and others like them justify a feeling of optimism, and that alone is so much to the good; it always is if the optimist be not blind to facts and realities.

During September the prices of raw wool and cotton rose, thus enabling manufacturers to liquidate their stocks of goods, and clearing the way for the manufacture of further stocks. Naturally there is still a great deal of timorousness about embarking on a large manufacturing programme at a time when costs of production are falling, but anything which has a tendency to ease up the position is so much to the good.

The inquiries received for iron and steel continue to increase, and these trades are not incommoded by the presence of large stocks. Manufacturing operations can therefore be commenced as soon as any of these inquiries mature into orders. The shutting down of blast furnaces owing to the coal strike causes most of the steel now being turned out to be made from imported pig iron and scrap metal, but furnaces are being restarted almost every day now, and this state of things should soon be remedied.

The receipt of inquiries in increasing numbers is a proof of the truth of our contention that the potential demand for manufactured goods already exists. The iron and steel industries, whose finished products form part of the raw material of the electrical industry, will naturally feel the approach of better times before our industry; but we are informed that the lamp trade shows distinct signs of improvement, so that it seems reasonable to anticipate improved conditions in heavy electrical engineering before long. Many orders for Welsh coal have recently been received.

The hardware and cutlery trades show signs of improvement, particularly in the export field, but naturally these are more subject to competition from Germany, which is becoming increasingly keen. The pottery and leather trades are also looking up, in spite of the fact that here, as elsewhere, buyers are holding off in the hope of a fall in prices. The best way of

bringing about a fall in prices is, of course, the placing of orders, so that costs of production may be brought lower, and overhead charges reduced by increase of output. There is no reason to doubt that for some years to come increasing business will mean lower prices. Manufacturers who have learned anything at all from the course of events during recent months have learned that rising prices kill demand, and until all the factories in the world are gorged and congested with business, it is unlikely that we shall see any considerable rise in the selling price of goods.

The comparison of the sum total of British trade, both import and export, for September, 1921, and September, 1920, shows a decrease of some 40 per cent. in money. The Government, straining at gnats, as is the custom, has abandoned the compilation of statistics as to the weights of exports and imports, although it is obvious that weight is a much surer index of the volume of business than monetary value, especially in these times of rapid fluctuation in the purchasing power of money. Statistics, judiciously used, are of immense value, and for the country not to be in possession of the facts as regards the amount of its import and export trade, is as bad as for a trading concern not to keep any record of its sales or of its costs.

The number of unemployed persons, while still terribly high, has decreased materially since June; and although relief measures, in the form of work or allowances will have to be continued through the winter on an unprecedented scale, the rising volume of trade must have the result of improving the situation.

The utmost use must be made of the most economical methods of manufacture. The prosperity of the nineteenth century was built up upon the work of Watt. The steam-engine then represented the most economical method of using coal. The use of electricity must be extended in all directions. Sir Leo Money hammers away week by week upon the necessity of cheap energy. Coal must come down in price, and electricity must develop. He even advocates a coal subsidy, regarding the expense of thereby encouraging the coal trade as analogous to the expenditure of a farmer upon manure to improve his crops. In general, the effect of a subsidy is to encourage the use of capital and of labour in a trade which normally would be unprofitable, and consequently diverting that capital and that labour from being used in something more profitable. It is true that this view appears to assign limits to the amount of capital and the amount of labour available, and in the long run this is not right. The more work there is to be done, the greater the population that can be supported, and the greater the population, the more work there is to be done. The human family is very far from exhausting the natural resources of the globe, even in the matter of food. Moreover, since modern commerce and manufacture depend on fuel, coal mining is so fundamental an industry that it simply *must* be carried on. It must be done economically, of course, and the most modern methods and machinery must be employed in coal extraction. Capital must be judiciously expended, in order that the greatest results may be derived from the work done. In abnormal times, and in special circumstances, the use of unusual remedies is justified, and may, indeed, become imperative.

The burden of taxation is, as we all know to our sorrow, enormously heavy. It has probably passed the economic limit in nearly every case. The notorious excess profits duty, while founded on the perfectly unexceptionable theory that profits made out of national emergencies must be returned to the nation, was damaging to industry both in its incidence and in its removal. Since profits were limited, it did not pay to develop manufacture to its full extent, yet the very fact that the profits over and above those fixed by the taxing authorities were confiscated, caused some improvements to be made that otherwise would have been postponed indefinitely. Structural improvements in factories, a certain lavishness as regards employment, and in some cases increases of remuneration, were defrayed out of the excess profits tax. When it was removed, and the whole of the profits became available for distribution, improvements were abandoned, workers were discharged, and remuneration was not infrequently reduced. When the tax existed, new businesses were so hard hit as to make it not worth while to establish them; while old establishments which had never paid any dividend at all, paid excess profits duty and still could not pay their dividend, thus discouraging the investment of much-needed further capital. The history of that tax, ending as it did in a shower of refunds, is one of the most unfortunate that has been recorded in the annals of modern taxation.

Direct and indirect taxation are to-day at figures which would have been deemed fabulous before the war. Men pay a shilling for twopennyworth of tobacco, and every sovereign earned is only fourteen shillings by the time it reaches the pocket, and inflated shillings at that. The craze for parsimony reacts unfavourably on industry, and the extravagance that still prevails in many quarters affords numerous examples of misdirected expenditure.

The revival, of which symptoms seem to be showing themselves, will be slow, but if we believe in it and in our power to bring it about, it will be sure. The future depends on each and every individual, firm, and nation getting right ahead with the job before it, and carrying out that job, whatever it may be, with enthusiasm, efficiency, and true economy.

A New Dynamo.

The method of constructing electric generators and motors has not deviated from standard practice by any appreciable extent for many years; that is to say, no radical alteration in design has been introduced, indeed, it is not to be expected that it will be, so long as conventional ideas are adhered to. If it is desired to produce an innovation one has necessarily to strike out in a new and original direction. To seek it along well-defined paths would be a waste of time, because it would only lead one to the same old limitations.

It was with peculiar interest, therefore, that we recently availed ourselves of an opportunity to inspect an invention which, if it is successfully developed so as to yield the results that are promised, will be of the first importance to the electrical industry. The invention referred to is the outcome of much patient labour by Mr. Brooks Sayers, who has evolved a design which, it is claimed, will reduce the cost of building a dynamo or motor by one-third. The great value of such a reduction in the cost of manufacture will be, no doubt, readily appreciated, but that is not all. It is estimated that, for a given weight and size, a machine can be constructed on the new principle that will be capable of producing an output very nearly double that of a standard machine. Moreover, the motor can be run, if necessary, very much faster than is usual at present, and the dynamo may be driven at the same speed as the turbine if required.

Now similar claims to those expressed above are not exactly novel; they are made periodically with fairly regular frequency, but it is often difficult to appreciate the special feature that would make them possible. In the present instance, however, definite proposals are made to construct the machine in such a manner as to reduce the heating, eddy-current, hysteresis, and other losses, in addition to commutation troubles, to a very considerable extent.

Herein, then, lies the reason for the increased efficiency that is promised, and it only remains to be seen whether a full-sized machine manufactured under commercial conditions will function as satisfactorily as the models have done, and we hasten to add that we know of no reason why it should not.

In conclusion, it should be pointed out that, for various reasons, it would be inadvisable to reveal technical details at the moment, although experimental machines are to be seen in operation in London. Mr.

Sayers deserves hearty congratulation on the successful issue of his labour, so far as it has gone, and we hope that rapid progress will be made in developing the invention.

The New Session of the I.E.E.

Yesterday the Institution of Electrical Engineers opened its first session as a body endowed with the dignity of a Royal Charter; we have no doubt that it will prove fruitful of benefit to the industry, not only in respect of the papers discussed at the public meetings, but also—and perhaps in much greater measure—in respect of the operations of the Council and Committees which will be called upon for advice and assistance by the Electricity Commission and other departments of the public service, functions which have continually increased in recent years both in number and in importance. The programme arranged for the first part of the session for the ordinary meetings is of good promise, and we note with interest that to the first of the "Informal Meetings," which will be held on Monday next, a most important subject has been entrusted—namely, "How best to speed up Electrical Progress"—the discussion on which will be opened by the President, Mr. J. S. Highfield.

We must confess to some misgivings lest, in the dignified surroundings of the theatre of the Institution, the distinctive character which has been acquired by the "Informal Meetings" within the hospitable but less awe-inspiring environment in which they were inaugurated may be imperilled. Already we have seen that the Committee in charge of these meetings has relaxed the rule of "No Publication of Speeches" to the extent that it has authorised one of its own members to supply an official summary to the Press—yet it was a cardinal principle in the first instance that no speeches should be reported. Now that the meetings will be held at the Institution, the delightful informality of refreshments served during an interval in the discussion may be abandoned, and eventually the "informal meeting" may become a mere imitation of the formal "Ordinary General Meeting." *Absit omen!* We hope that the Committee will bear in mind the purpose of these meetings, the success which they attained in previous sessions, and the dangers with which they are now beset, and will jealously safeguard their amenities in every respect, so that the speakers who have delighted us in the past may not be driven into silence.

The meeting time of the ordinary meetings has been fixed, as in recent years, at 6 p.m. We believe that this is a popular though by no means unanimous choice, and we trust that it will enable the informal dinners which were started by Mr. Wordingham to be revived.

The Press and Accuracy.

A record of the meeting of the National Joint Board, held on October 21st, which has been circulated to the District Councils, contains a reference to the Press which is, we think, very much out of order. The matter dealt with was the proposed agreement between the E.T.U. and the E.P.E.A. The record states that "the chairman observed that notices had appeared in the technical Press regarding this agreement, and the employer members of the Board were very anxious to know the extent of this agreement." The report goes on to say that Mr. Heslop said that the "remarks published in the Press were erroneous, and that the agreement was purely a question of domestic policy." Thereupon the report states that an offer was made by the E.P.E.A. to give copies of the agreement to the employer representatives on the Board and on the District Boards on the understanding that they were to be considered confidential; the explanation was satisfactory to, and the offer accepted with thanks by, the employer members.

The point we consider not in order is that a general statement that the "remarks published in the Press were erroneous" should be circulated by a responsible body such as the National Board without chapter and verse. The "Press" in this instance, as shown by the chairman's opening remark, was the technical Press of the industry. Without claiming that the technical Press is always accurate in every detail, we do claim that every attempt is made to be accurate on fact and sound in opinion. We are not, of course, concerned with any statement made by an individual; what we object to is that a responsible Board should accept a statement and publish it, without giving any indication that it has satisfied itself that the statement is (or is not) justified.

Railway Electrification.

Following on the final report of the Advisory Committee on Electric Railway Standards, quite a flood of projects for the electrification of suburban railways and the construction of new tube railways in the Metropolitan area has come upon us. The most recent of these are the proposal of the Underground Electric Railway Company, involving the expenditure of some £6,000,000, and that of the London County Council, contemplating the outlay of £5,000,000, both relating to the construction and improvement of tube and surface railways in London. The L.C.C. scheme, which was indeed no more than a suggestion, was rejected at the meeting on Tuesday last; the other, however, is in an advanced stage, and work could be commenced at once if the capital were obtainable on reasonable terms. In both cases it was proposed to take advantage of the Government offer to guarantee loans for works calculated to promote employment in the United Kingdom.

It is important to note that under existing conditions, it is impracticable to construct new tube railways with any hope that, under ordinary commercial conditions, they will ever produce a satisfactory return on the capital expended. Transport facilities form one of the public services which are indispensable to the life of a great community such as the Metropolis represents; the surface traffic has in many areas reached the saturation point, and future additions to the facilities must necessarily be underground. In order to provide them, the co-operation of the State is essential, whether it be effected through the medium of the Government, or of the County Council, or of a future London Transport Authority, and this fact is clearly indicated by the two proposals to which we have referred.

The Engineering Trades Ballot.

By the time this issue of the Electrical Review is in the hands of our readers it will be general knowledge that the members of the 34 trade unions involved in the engineering and shipbuilding industries have balloted in favour of accepting the proposal of the employers to withdraw the 12½ per cent. bonus given by Mr. Churchill when he was Minister of Munitions. It is true that less than one-third of the workers affected took the trouble to express their views on the subject, but it is nevertheless satisfactory to note that a clear majority of those who did so has been obtained for the course of action suggested.

Some fairly substantial improvement in production costs should be the result, especially when the reduction in wages is reflected in the cost of materials. This is necessarily and naturally a slower process in a falling than in a rising market, but by the New Year it should be quite evident. The step is definitely in the right direction, and we hope it may be followed by a real effort to increase production. The lessons of adversity having apparently been brought home to Labour sufficiently to cause agreement to the wage reduction, it is, perhaps, not unreasonable to hope that the responsible leaders of the workers, together with the rank and file, will realise speedily that it is possible to cheapen production still further by the abolition of restrictions, by a return, as suggested by Mr. Llewelyn Atkinson, to the longer working week, and by putting their shoulders to the wheel to the utmost of their ability. Having regard also to the signs already visible of increasing briskness in trade, the future seems rather more hopeful.

NEW DEVELOPMENTS IN ELECTRIC COOKING.

Electric Cooking on the Great Northern Railway.

In a new five-car train (fig. 1), which the Great Northern Railway Co. has recently put into service between London and the West Riding, a distinct advance has been made in the history of British railways. Among a whole host of improvements, the elimination of gas is the most satisfactory feature of the new train, as in far too many accidents the rupture of the gas tanks has led to the most horrible circumstances.

While individual pieces of apparatus such as electric kettles, urns, food warmers, &c., are frequently used in railway carriages, this is the first dining-car train on which the cooking is entirely done by electricity, and naturally the details of the application have required special consideration, for which credit is due to the enterprise of the chief mechanical engineer of the G.N.R., Mr. H. N. Gresley, under whose personal supervision the work has been carried out. The whole of the apparatus has been supplied by Messrs. J. Stone & Co., Ltd., of Deptford, whose well-known system of electric lighting is also fitted on the train.

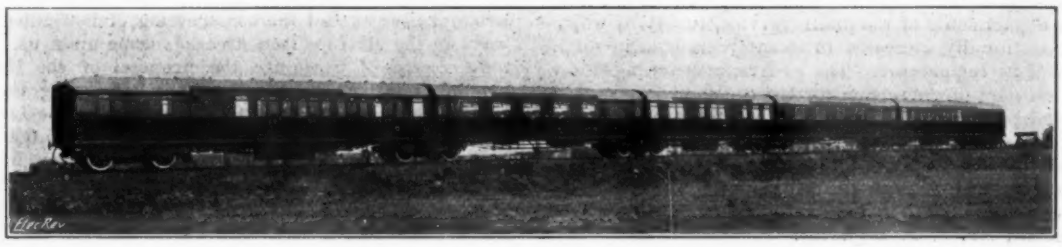


Fig. 1.—New G.N.R. Train with Articulated Coaches.

The electrical cooking apparatus installed in this train was designed and manufactured by the Jackson Electric Stove Co., Ltd. The main equipment of the kitchen (fig. 2) consists of a combination suite composed of an oven for roasting and baking, measuring 24 in. high, 20 in. wide, and 20 in. deep, and loaded to a maximum of 3.5 kW. Above this is fitted a steaming oven for the steaming of potatoes, puddings, &c., measuring 18 in. by 18 in. by 20 in., this being loaded to 3 kW. Above the steaming oven is fitted a grill with a raising and lowering grid having a grilling surface of 18 in. by 12 in., and loaded to a maximum of 3 kW, this being surmounted by a water boiler in which is fitted an immersion heater of 500 watts capacity.

By the side of the equipment is mounted a table containing four open-type boiling plates and two 10-gallon boiling pans. The whole of the equipment, with the exception of the small immersion heater and water boiler, is arranged for heat regulation, the appliances being specially constructed and thoroughly well heat-insulated to obviate excessive loss due to radiation. The switchboard controlling the apparatus, mounted at the back, is fitted with busbars and built upon well-conceived and sound principles. The whole of the connections can be inspected by merely removing the front cover of the board. The heating elements of the cooking apparatus are easily accessible, and have solid rod connections throughout, mounted on porcelain insulators. No loose wires, loose leads or beads of any description are employed, the apparatus being built to stand hard wear; the replacement of an element is an extremely simple matter.

A 4 ft. by 2 ft. by 2 ft. 9 in. hot cupboard with plain

Fig. 2.—The All-electric Kitchen.

Fig. 3.—First-class Dining Saloon.

top, the cupboard being double cased and lagged and loaded to a maximum of 2.5 kW, a water urn, two six-pint kettles, and a fish fryer complete the equipment.

The apparatus is specially designed to operate on a varying voltage of 150-220 V, special elements, of course, being needed for this wide variation.

A 40-gallon tank for warm water is fitted in the roof of the corridor alongside of the kitchen, and heating elements are clamped to the underside of it; from the warm water in this tank the boiler on top of the oven range and the hot water urn are supplied, and this enables boiling water to be obtained very quickly.

Inasmuch as the length of run of this train is comparatively short, and the luncheon is required to be served shortly after the commencement of the journey, and in order to minimise the capacity and weight of the battery and generating equipment to be carried, connecting plugs and sockets are provided on the train, so that when in the terminal stations the supply of electrical energy for preliminary operations may be drawn from the station supply.

A main throw-over switch enables the load to be changed over to the d.c. supply from the battery and dynamos before leaving the terminus. Subsidiary boards are provided for each main group or important element of the apparatus, carrying separate switches for the control and regulation of the heat of individual elements. Pilot lamps are set over the switches. Electrical energy for operating the cooking apparatus while the train is under way is provided by two of Messrs. Stone's "Lilliput" dynamos, carried on the underframe of the kitchen car, supplemented by a battery of accumulators to enable cooking operations to be continued during intermediate stops. The dynamos are each of 6 kW capacity with self-contained automatic pole changers, and they are belt driven from the axles of the trucks.

Automatic switchgear is provided for the control of the machines, to connect them to the battery and the cooking equipment as soon as the machine is running at the pre-determined speed and to disconnect them on falling below this speed. A battery overcharge-preventing switch automatically diverts a portion of the current from the batteries as soon as the fully charged condition is reached; the current so diverted is utilised by passing it through a supplementary heater applied to the warm water tank. "Motoring" switches with resistances are provided, one for each dynamo, conveniently placed so that the examiner can readily "motor" the machine to test it in the regular way to see that it is in working order. The motoring switch has a spring on the lever so that it cannot be left in the "on" position; immediately the lever is released the circuit is opened. As a safeguard against an excessive load being imposed on the dynamos and battery while in service, an overload circuit breaker is fitted, and before this will hold in (on the lever being replaced), the load has to be reduced by turning off or reducing to lower heat one or other of the cooking elements. An ammeter and 3-way switch enable the output of either dynamo or the total load due to the apparatus in use to be read at any moment; an ampere-hour meter is fitted, which indicates the state of charge of the battery. The accumulators are small, measuring 3 in. by $6\frac{3}{8}$ in. by $14\frac{3}{4}$ in., and are of the light-weight, high-capacity type, 9-plate size, in ebonite boxes with lids sealed down. They have screwed vent plugs for access to the acid for testing density, refilling, &c. The battery comprises 80 cells, arranged in two boxes on the underframe. The weight of the complete battery is 1,880 lb. The wiring is carried in enamelled screwed conduits, which are earthed, as also are the frames or casings of the various cooking apparatus. The plug connections for the supply from the station mains are interlocked with a valve on the train pipe, a lever controlling this valve being so placed that while the plug is connected the valve is open and a vacuum cannot be created in the train pipe. Additional sockets are arranged for conveniently charging the battery at terminal stations.

The advantages of cooking by electricity in a railway train will be apparent to everyone, but special mention should be made of the better conditions, the cooler and purer atmosphere, in which the *chef* is able to do his work. Meat which has been cooked electrically is better cooked, more palatable, and more nutritious than meat cooked by gas. The objectionable smell of gas is, of course, eliminated.

The fans in the dining cars (fig. 3), instead of being fixed in the usual position on the end partitions of the dining cars, are electric extractor fans fitted in the roof of the carriage. In addition to these, the usual torpedo ventilators are provided.

Semi-indirect electric lighting is provided in the dining cars, being fitted in the centre of the roof. The first-class saloon is provided with alabaster bowls 12 in. in diameter, and in the third-class saloon are fitted obscured glass bowls. In addition to these, table lamps are provided in the first-class saloon. Each of the bowls is provided with four 25-c.p. gasfilled lamps, the total candle-power provided in the first-class dining saloon being 750 and in the third-class 600. The light is so diffused by means of the plain white roof and the indirect fittings, that there is an entire absence of glare and no objectionable shadows. The lights throughout the unit can be controlled either from the guards' vans or by the dining car conductor.

Sufficient has been said in the above notes to prove that a great step forward has been accomplished by the Great Northern Railway Co., and we hope that in a few years' time this type of train will be a commonplace, failing the electrification of our main lines.

The B. & K. Electric Restaurant.

The electric restaurant which was opened by the Brompton & Kensington Accessories Co., Ltd., at Earl's Court, in 1913, is in many respects unique. In our last issue we explained its origin—the necessity of developing a domestic load other than lighting, to make good the deficiency of load resulting from the increase in the efficiency of glow lamps, the Accessories Co. being a subsidiary concern formed by the Brompton & Kensington Electricity Supply Co., Ltd., for this purpose. It is claimed that the "B. & K." restaurant was the first of its kind in London, the second in the United Kingdom, and that as now constituted it is without an equal in the world. In addition to meals served on the premises, it has developed a thriving business in the sale of cakes, pastry, and other cooked dishes, and the company manufactures and sells electric cooking and heating appliances of all kinds. It will readily be understood that these several functions are mutually helpful; in fact, the restaurant was established in order to enable the owners to perfect their electric cookers by acquiring experience at first hand, instead of depending upon the complaints of users to reveal defects, and consequently there is justice in their claim that their appliances are well-tried apparatus, which can be relied upon to give good service for long periods. Moreover, the restaurant fulfils the important function of education; its kitchens and other departments are always open to inspection, and are kept up to date in every respect. As a result of this far-sighted policy, the Supply Co. has 500 domestic electric cookers on its mains, as well as restaurant equipments and bakehouse installations, and looks forward to a rapid increase in the number.

Fully to appreciate the amenities of this establishment, in respect of its culinary equipment as well as of its provision for the comfort of its customers, a visit to the premises is essential; it will be found that all that we say of its merits falls short of the reality. We can here only indicate the nature of the arrangements and of the apparatus installed, with the aid of a few illustrations.

The Servery.—The servery is the centre of distribution for the whole restaurant (fig. 2). Its equipment has a total loading of 15.3 kW, and comprises the following items: A three-dish carving table, a hot-cupboard (on rollers) to accommodate 800 plates, a heated serving shelf, aluminium soup tureens in a water bath, and bains

maries for vegetables and coffee. Water at 150 deg. F. is supplied from the hot-water system to the bains-maries and water baths, and is raised to simmering temperature by immersion heaters.

In the servery also there is a grill and toaster, with a hot-cupboard, fixed at a convenient height; two three-heat switches are provided, so that when the grill is being used intermittently, the switch may be turned to "low" (one-quarter heat), keeping the fire-bars hot enough to attain their full working temperature within a few seconds when the switch is turned to "high." Aluminium plate-warmers are fitted in the servery, and in each room of the restaurant, with the result that food is served at table at the highest temperature (140 deg. F.), permitting of consumption with comfort.

The Main Kitchen.—The special features of all the kitchens are that they are clean, bright, and well ventilated; there are no fumes, the lay-out being well balanced and convenient, with the apparatus well above the floor level; no stooping or bending is called for; all the controlling devices are placed at a lower level than that required for cooking; all tables and cupboards are mounted on rollers; no wires or cables are visible anywhere, and the fuses are conveniently placed but unobtrusive; there is an indicating lamp to every switch; the lighting is effective and diffused from a hidden source; there is a plentiful supply of hot and cold water; all floor corners are rounded, and there is no possible hiding place for dirt or vermin. There are no flies or beetles in the "B. & K." kitchens.

The equipment of the main kitchen comprises the following items: A central double boiling table fitted with twelve 2,000-watt "universal" boiling plates, and accessible on all four sides; two roasting ovens, each of 12 cu. ft. capacity; one four-compartment oven of a capacity of 28 cu. ft., capable of dealing with 2 cwt. of meat at once; and fish fryers, grills, mincing machines, a Hobart pastry mixer, two small hot-cupboards with vegetable bains-maries, and two aluminium plate-warmers. The boiling utensils are of cast aluminium with machined bottoms, and corners externally square and internally rounded, to ensure efficiency and cleanliness.

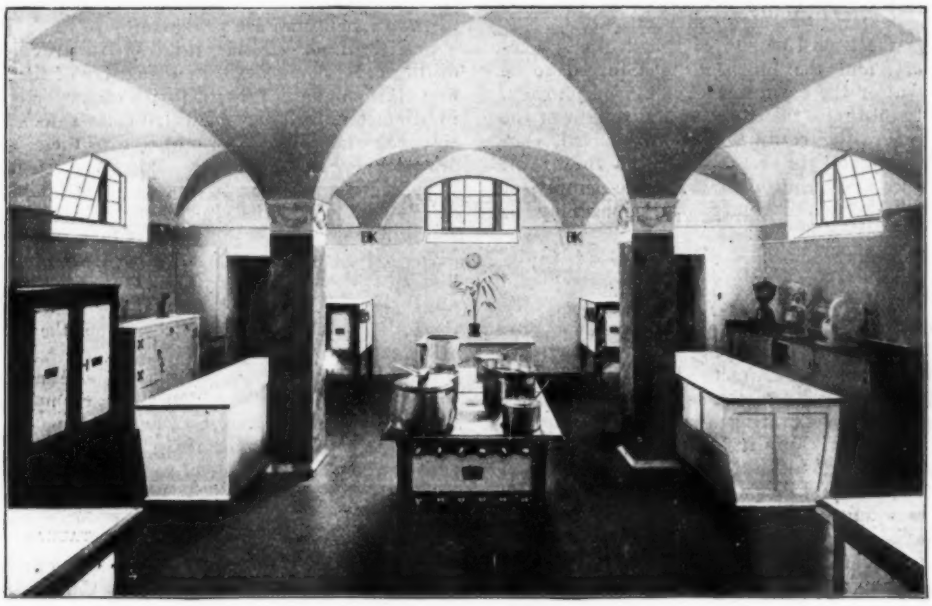


Fig. 1.—The "B. & K." Restaurant: Main Kitchen.

The large oven can be used as a 1, 2, 3, or 4-compartment oven of varying sizes at will. As each compartment is separately controlled, a very wide range of totally different classes of cooking can be carried on simultaneously, the temperatures ranging from as low as 120 deg. F. in the bottom oven, for proving or drying meringues, through the varying higher temperatures required for casseroles and roasting, up to the temperature of between 450 and 500 deg. F. in the top oven required for French pastry.

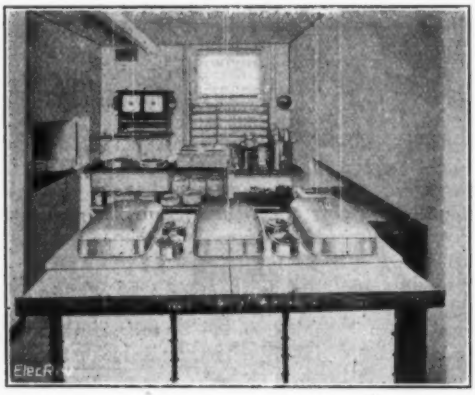


Fig. 2.—The Servery.

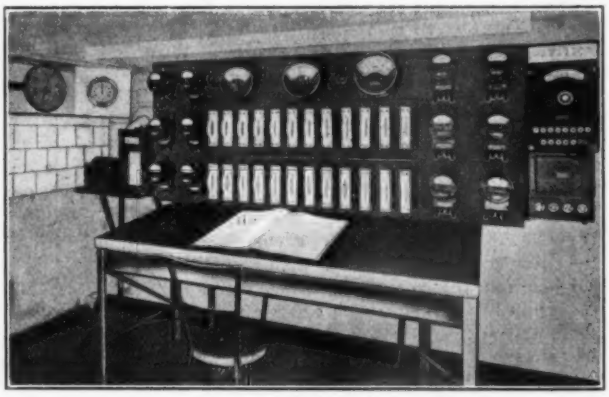


Fig. 3.—The Control Room.

The Vegetable Kitchen.—The boiling and steaming of vegetables, together with all other steaming operations, are kept entirely separate from the main kitchen for

the sake of convenience and cleanliness. A waste lift carries all refuse from the vegetable kitchen direct to the bins in the area below. For this reason these model kitchens have been free from flies during the exceptionally hot summer we have just experienced.

The equipment consists of a steaming oven fitted with five galvanised wire baskets, each capable of accommodating 25 lb. of potatoes, fish, suet puddings, &c., the heating elements being of the immersion type; a five-tier steamer for similar operations; a 30-gallon boiling pan; and a cooker for roasting potatoes and the preparation of specialised vegetable dishes.

Adjoining this kitchen is the scullery for washing, cleaning, and storing all cooking utensils.

The Pastry Kitchen.—This is equipped with one two-tier pastry oven, which supplies the whole of the confectionery department with French and English pastries. The proved excellence of the "B. & K." pastry is due in a large measure to the certainty of results obtained from this oven, the elimination of all variables and guess-work, which is the pre-dominant feature of all electric cooking, being, perhaps, more important in this

Fig. 4.—Part of the Restaurant.

branch of the culinary art than in any other. All the tables are placed on rollers, as well as two galvanised-iron flour bins. The pastry kitchen is in direct telephonic communication with the confectionery counter, just as the main kitchen is in contact with the restaurant manager's office, thus facilitating the smooth running of the whole establishment.

The Control Room.—This room, which is situated immediately beneath the kitchen, is the nerve centre of the whole establishment. It contains a very complete equipment for recording the consumption and measuring the temperature at which every cooking operation is carried out in the kitchens.

To attain this end, a separate watt-hour meter is connected in circuit with each oven, boiling table, fish fryer, &c., in the various kitchens. Thus it is possible not only to obtain the overall consumption of the whole kitchen for any period of time, but also to check the consumption on any single piece of apparatus. A recording ammeter is installed, which can be connected in series with any piece of apparatus on test, so that a graphic record of the variation of the loading may be obtained. The temperatures are very efficiently checked by means of a multiple electrical distance thermometer. A platinum resistance thermometer is fitted not only in each oven, fish fryer, hot-cupboard, &c., but also inside and outside the main kitchen, in order to get a comparison of the actual working temperature in the kitchen with that of the atmosphere outside. These thermometers are connected to a galvanometer in the control room, so that an immediate and accurate reading of the temperature prevailing during any cooking operation may be obtained at any moment.

The equipment in the control room is completed with an electric clock synchronised with every clock in the building, and a Cardew open dial voltmeter.

A tour round the whole establishment shows that the utmost use is made of electricity throughout the multifarious operations connected with the preparation, cooking, and serving of meals, down to the electric cash registers, signs, and plate washers. With regard to the last named, a very efficient and up-to-date electrically-operated teak plate-washing sink is installed in the basement for cleansing all the plates, dishes, &c., from the restaurant. One attendant can deal with as many as 1,000 plates per hour, which are soaked, washed, sterilised, and dried with the minimum of labour.

SCIENTIFIC AND INDUSTRIAL RESEARCH.

The sixth annual report of the Committee of the Privy Council for Scientific and Industrial Research has been published (Cmd. 1,491; price 1s. net). In presenting the report, the Lord President of the Council (the Rt. Hon. A. J. Balfour) says that the necessity for restricting public expenditure led to a curtailment of resources which has caused the committee great anxiety. A total sum of £40,889 was expended on the Fuel Research Station during 1920-21. A long series of experiments on the effects of steaming various coals in vertical gas retorts has been completed and a report issued. The results show broadly that substantial gains can be made in the gas evolved, and also in the by-products, tar and sulphate of ammonia. A report has now been issued dealing with the experiments on low-temperature carbonisation and the carbonisation of air-dried peat at various temperatures. The expenditure of the National Physical Laboratory is settling down to a permanent level now that the war activities of the Laboratory have been completed. The number of approved industrial research associations is now 26, and grants under this head amounted during the year to £74,557. The income provided by the interest on the unexpended balance of the Million Fund amounted to £51,889. After applying £13,867 to meet industrial research and other charges, the balance was appropriated in aid of the Vote of the Department. During the year approximately £40,850 was given in grants to 245 students and research workers and assistants. Sir John F. C. Snell was added to the Advisory Council.

The three main Co-ordinating Research Boards commenced work almost a year ago, and their preliminary investigations appear to show that there is remarkably little overlapping in the researches conducted by the different services. In many instances where the same problem is being attacked at different establishments, it is treated from very different points of view. Should any commercial development be of importance to only one fighting service, that service is in the best position to supply such information as the Government possesses; but this is exceptional and usually all three services are interested in varying degrees. A recent conference between representatives of the fighting services and the British Electrical and Allied Industries Research Association, called to discuss the possibilities of research aiming at improvements in accumulators, brought this out very clearly. It appeared that, although the immediate requirements of the services differed, each wanted much the same information; on the other hand, each had some information to give. There are a number of researches which were undertaken during the war, for war purposes, which can be extended to meet civilian requirements. Among these may be classed the inspection of materials by means of X-rays.

In briefly describing the work of the various associations, the report repeats the warning against the short-sighted policy of confining research organisations to the search for results of immediate commercial value. It is recorded, however, that associations are concentrating more and more on the fundamental principles underlying the methods and processes of their trades. Among the activities of the British Photographic Research Association was included a study of the contrast and exposure in X-ray photographs through metals. As a result of representations made by the Medical Research Council, a conference was held between representatives of the British Scientific Instrument Research Association and leading radiologists, with the object of obtaining information as to the lines along which improvement in the manufacture of X-ray apparatus should be sought, in order to meet the requirements of the medical profession. A sub-committee was appointed to co-operate with the Electrotherapeutic Section of the Royal Society of Medicine to draw up a complete specification for an X-ray outfit complying with modern requirements. The Scientific Instrument Research Association has found it expedient to arrange for close co-ordination with the British Electrical and Allied Industries Research Association in electrical researches of common interest to the two bodies.

In the National Physical Laboratory a number of researches are in progress as a "free service" for civilian Government Departments. Among these may be mentioned: Illumination, for the Factory Lighting Committee of the Home Office; an investigation for the Office of Works relative to the lighting of public buildings; and tests of ships' navigation lights for the Board of Trade. Research is being instituted with a view to the production of high-class insulating materials in this

country, in order to avoid dependence on foreign sources of supply. It was ascertained that the Government Laboratory had had considerable experience of some of the problems involved in the production of artificial materials of this kind, and investigations are being continued there. Arrangements have also been made with the British Electrical and Allied Industries Research Association to extend its work on insulating materials in conjunction with the N.P.L. The latter is also carrying out researches into such matters as searchlight carbons, alloys for compass correctors, non-magnetic steels, &c.

The progress made by the various sub-committees of the Radio Research Board has been satisfactory, although it has necessarily been handicapped by the present lack of experienced investigators to undertake the type of research required by the Board. The Board has arranged for an extensive investigation into the origin and fundamental nature of "atmospherics," with a view to providing data which it is hoped will lead to the development of reliable apparatus for their elimination. The Aldershot wireless station of the Meteorological Office has been taken over for this purpose. The Directional Sub-committee has enlisted the co-operation of seven colleges and four Government technical establishments in a scheme for making simultaneous observations in various parts of the country. These observations are made with identically similar instruments, and the observed errors in bearing are carefully collated. Grants have been made for the carrying out of important research work in connection with thermionic valves, &c.

The work on Dielectric Separation, commenced by Mr. S. H. Hatfield under the Tin and Tungsten Research Board, has been completed, and it is considered that it is possible that a process has been evolved which may prove useful in the separation of minerals from their ores, or from one another, and may be capable of wide application. The Lubrication Research Committee has carried out further researches into the fundamental theory of the action of lubricants in sliding friction and the influence of small quantities of fatty acids upon the lubricating properties of mineral oils. A committee on Gauging Rivers and Tidal Currents has been formed, and as a preliminary a bibliography of the subject has been prepared with a view to ascertaining what further work is required.

The British Electrical and Allied Industries Research Association has taken over the whole of the work of the Electrical Research Committee. This includes researches upon fibrous and composite insulating materials, porcelain, mica, coil-insulating, buried cables and overhead wires, electrical control apparatus of various descriptions, and on dielectric losses, and the drawing up of standard specifications for the purchase of electrical materials.

Included in the appendices to the Report are a list of works by persons in receipt of grants; notes on research organisation in the overseas dominions and foreign countries; and a list of departmental publications.

LEGAL.

Charles Semon & Co. *v.* The Bradford Corporation.

This case, which was mentioned to Mr. Justice Peterson in the Chancery Division on Friday last, is a motion by the plaintiffs, Bradford woollen merchants, to restrain the Corporation from obstructing ancient lights by building extensions at the Bolton Road electricity sub-station. The land opposite Semon's has been vacant hitherto, and the Corporation proposes to put up a building 70 ft. high. For the Corporation, Mr. Cunliffe, K.C., suggested that this was a case for early trial, and in the meantime he undertook that building should not proceed above 45 ft. high, the street being only 45 ft. wide.

The motion therefore stood over with a view to an early trial of the action.

Fraudulent Consumption of Electricity.

The *Birmingham Post* reports that the maximum penalty of £20 was imposed by the Worcester magistrates on Saturday, on Thomas Jones, hairdresser, Sansome Street, Worcester, who was summoned for fraudulently consuming a quantity of electricity of the value of £2. Defendant pleaded guilty. For the prosecution it was stated that before defendant occupied his shop, a supply of electricity was provided by the Corporation, but, on the change of occupier, the supply was given up, and the Corporation took steps so that the energy should not be used. Recently an electric light was noticed in the front of the shop, and, as there was no meter, an inquiry was instituted. The seals which had been put in when the supply was cut off had been broken, and, by means of a thin wire, an improper connection had been made with the Corporation fuses. Defendant wrote an apology.

The Chairman (Mr. J. Mayglothling) said the case was of a serious character. The magistrates had considered sending the defendant to prison, but in view of his long residence and his previous character, they imposed the maximum fine, or one month.

THE SOUTH-EAST LANCASHIRE ELECTRICITY DISTRICT.

Reorganisation of Electricity Supply.

We have received a copy of the scheme for the reorganisation of the supply of electricity in the above named area that has been submitted to the Electricity Commissioners by the local authorities and companies that are supporting the scheme, together with the statistics therein referred to. The matter is set out in great detail, and we regret that we are unable to do more than briefly outline the proposals. Copies of the scheme are, however, to be obtained from Mr. A. H. Banks at the Town Hall, Manchester.

Arising out of the Electricity Commissioners' delimitation of the area*, the South-East Lancashire Electricity Committee was formed of representatives of every authorised undertaking in the district, and that body appointed a sub-committee consisting of 22 members, with Ald. W. T. Dagnall as chairman, which, after considering matters of general policy and the nature of the administrative body to be set up under the scheme, appointed an engineering sub-committee (Messrs. S. L. Pearce, chairman, R. Blackmore, R. Lomax, J. A. Robertson, C. D. Taite, S. J. Watson, and W. J. H. Wood) to prepare the technical details of the scheme. Some 43 authorised undertakers and local authorities have adopted the scheme, while the Electricity Committees of four others have passed resolutions in favour thereof that are awaiting confirmation by their councils. The scheme is divided into six sections. Parts 1 to 3 comprise a general statement of the electrical development in the district as it was on March 31st, 1920, together with the estimated development that will have taken place by 1925-26. Full statistics relating to the 26 generating stations existing within the area are given; of these six are company-owned, the remainder being municipal undertakings. Details are also given of the existing interconnection lines, of those in course of construction, and of existing e.h.p. lines that are suitable for use as interconnectors. They are of both the underground and overhead types, and operate at pressures of 33,000, 11,000, 10,000, and 6,600 volts. The total coal consumption for the area in 1919-1920 was 1,530,306,838 lb., which produced 486,991,001 kWh, or an average or 3.14 lb. per kWh.

The total maximum demand in the area for 1919-20 is given as 185,077 kW, and the plant capacity as 295,263 kW. It is proposed to construct eight new capital stations (on two of which the work of erection has already commenced), which will have a total plant capacity of 755,000 kW, the estimated maximum demand in 1925-26 being 432,230 kW, and in 1930-31 643,730 kW.

If the various stations were developed individually without regard to a scheme in order to accommodate the anticipated demands in the respective areas in 1925-26, the estimated coal consumption would reach a total of 2,257,899,280 lb., producing 1,067,886,400 kWh, or an average of 2.114 lb. per kWh. In 1930-31 the figures would be 3,290,001,000 lb., 1,618;961,200 kWh, and 2.0321 lb. per kWh respectively. Under the same conditions the capital expenditure would amount in 1925-26 to £8,078,000 on 330,450 kW of plant (£24.44 per kW), plus £100,000 on transmission lines and switchgear. Similarly by 1930-31 the capital expenditure would be £6,487,500 on 308,950 kW (£20.99 per kW), plus £300,000 for transmission lines and switchgear.

In addition to the new capital stations mentioned above, 17 existing stations would be utilised as part of the scheme, and eight stations would be extended by an aggregate of 78,500 kW, so that by developing on the lines laid down the capacity of the stations forming part of the scheme would total 622,175 kW in 1925-26, the maximum demand for the district at that time being 69.4 per cent. of the plant installed. In order to distribute the supplies as contemplated, it will be necessary prior to 1925-26 to construct 21 underground main transmission lines to operate at 33,000 volts, and the estimated capital outlay which will be involved in the scheme up to 1925-26 will be as follows:—Generating plant, £5,875,500 on 247,450 kW (average £23.74 per kW); transformers, &c., £220,650 on 153,000 kVA; cable, 69.2 miles (route miles 51.42), £504,730; switchgear £201,000, or a total of £6,801,880. The total coal consumption would be 2,213,476,480 lb., producing 1,077,279,628 kWh, or an average of 2.05 lb. per kWh, so that the saving that would result from the operation of the scheme as against individual development would be: Coal, 19,831 tons per annum at 35s. per ton, £34,704, and capital, £1,376,120 at 10 per cent. interest, £137,612—a total of £172,316 per annum in addition to substantial reductions in labour costs for the operation and maintenance of plant.

Part 4 deals with the second period of expansion. By further developing on the lines of the scheme it is estimated that by 1930-31 the plant capacity will have reached a total of 894,075 kW and the maximum demand 643,730 kW, or 71.9 per cent. of the plant installed, but after 1931 a ninth new station will be required.

In order to distribute the supplies as intended during the second period of development, it would be necessary to construct during that period 14 main underground transmission lines to operate at 33,000 volts, and the capital outlay between 1927 and 1931 would be as follows:—Generating plant,

* Elec. Rev., June 25th, 1920; p. 815.

£5,637,500 on 265,450 kW (£21.23 per kW); transformers, £114,750 on 90,000 kVA (15s. per kVA); cables, 55.2 (route miles 35.7), £418,200; and switchgear, &c., £114,200—a total of £6,234,650. The coal consumption at the end of the second period would amount to 3,209,722,789 lb., producing 1,637,555,260 kWh, or an average of 1.96 lb. per kWh, which shows a saving, by the operation of the scheme against individual development, of 35,838 tons of coal at 35s. per ton, equalling £62,716, and of £498,400 on capital outlay at 10 per cent. interest, equalling £49,840—a total of £112,556 per annum. The combined saving of both first and second periods would therefore be £250,168 per annum.

Part 5 contains general information showing that the supply would be 3-phase, 50-cycle, a.c. The main transmission pressure would be 33,000 volts, and the local secondary pressures 11,000 and 6,600 volts; at a later stage it might be desirable to adopt a main pressure of 66,000 volts. The stations to be shut down number eight, while four stations would continue to operate for the present, giving non-standard supplies.

Part 6 deals with the constitution of the proposed Advisory Board to consist of 48 members, 41 of whom will be elected by the authorised undertakers in the district; an Engineering Advisory Committee would also be formed to assist the Board.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Durability of Lead-covered Wiring.

Mr. O. Skidmore is not quite correct in stating that compo piping for gas has been used for years *without question*. Many gas undertakings have discontinued its use, and I am informed by an engineer to a large gas undertaking that iron barrel for gas piping in houses is to-day's standard practice. In any case, compo piping of the sizes generally used for gas to-day is considerably thicker than the lead compo coverings used for house wiring.

Plain lead-covered cable as used by the G.P.O. and for 11,000-volt supply is drawn into earthenware ducts, and thus is protected from certain salts which corrode lead.

Lead-composition-covered wiring is largely used by the G.P.O. for internal wiring, but a G.P.O. electrician informs me that faults due to corrosion and electrolysis are very frequent. He instanced a fault he located recently, where the lead covering of a wire which passed through a damp brick wall was found converted into a spongy white paste.

Were it not for this inherent weakness, why should the I.E.E. rules be so stringent with regard to the use of lead composition wiring? Amongst nearly a page of other rules relating to this system are the following:—

68x (c). "*They must not come into contact with damp brickwork or plaster.*" This rule should debar the use of compo-lead-covered systems in a new house where walls are anything but dry, and although a house may be perfectly dry when the wires are installed, some part of it may subsequently become damp.

Again, 68x (b). "*Lead-covered wires must be protected by wood or metal casing where buried in plaster, cement, or brickwork.*" And 69x. "*The resistance of the metal sheathing between any two points shall not exceed 2 ohms.*"

What proportion of installations are so protected, or ever tested for sheath resistance, or have their sheaths efficiently made continuous and thoroughly earthed? I venture to say a very small proportion.

In conclusion, I would recommend to "W. T. J." a good tough-rubber-protected system, which, though more expensive than lead-covered, has not the above objection or rules to be observed.

B. W. Gothard,
Chief Engineer.

Electricity Works,
Farnborough, Hants.
October 25th, 1921.

Your correspondent "W. T. J." need have no hesitation in adopting this system—it is absolutely reliable, and as durable as the best system in use. We think the following will convince him that this is so:—

The twin lead-covered system was introduced by this firm 27 years ago, and has been used for work of every description. Many important installations, which may now be classed as aged, have never cost a copper for repairs beyond the usual upkeep of switches, lamp-holders, &c. We should be very glad to furnish your correspondent with a list of many hundreds of contracts which we have carried out on this system, including private residences (town and country), factories, cold stores, breweries, steam ships, and, in fact, every place where electric wiring may be subject to hardship. There are, of course, special points to be noted in the carrying out of work on this system. First, damage to the lead covering by clumsy handling in fixing must be avoided. Secondly, the lead covering must be brought well through the walls where it may come into contact with wet plaster, otherwise damage will be done by "creeping" of moisture. Insulation defects at the start will nearly always be found within a few inches of the end of the cable. Thirdly, mechanical damage must be provided against, and switch drops on the surface are best protected with a neat wood moulding, stained or painted as required. In positions under floors, &c., where there is special risk of damage, steel channelling is specially made, and where passing through brick walls short pieces of tubes should be used to prevent abrasion of the lead when pulling through. Fourthly, it is absolutely necessary that the lead covering should not be a mixture, such as "compo," which in damp positions will not last any time at all owing to local action or electrolysis. Lastly, it is of the utmost importance that the lead covering should be continuously and efficiently earthed.

There are many makes of suitable junction boxes, &c., for use with this system, and we should be very glad to demonstrate the utility and reliability of the system to your correspondent, or anyone who will refer to us.

Tyler & Freeman.

London.
October 25th, 1921.

The practical electrician referred to by "W. T. J." is not the only one who has condemned lead-covered wiring. I have had power-station engineers do the same thing, saying that the use of this system should be prohibited.

My experience is that lead-covered wiring, when properly installed and carefully used by the wiremen, is equal to any system in steel conduit, excluding C.T.S., equally free from faults.

If "W. T. J." will get his electrician to install lead-covered wiring, using Callender's Kaleeco system, or, in fact, any of the later forms by any of the cable makers, he will have no cause to complain; but he must have a really good man to handle his materials.

M.E.C.A.

London Branch.
October 26th, 1921.

Why is it that when an individual objects to anything, somebody like "Othello" (who does not sign his name) comes along and talks about "personal prejudice"? Is not the fact of Othello so loving lead-covered systems, also personal prejudice in favour of these, or perhaps I should say, one of these systems?

Personally, I hate lead-covered systems, and I am glad to relate that we are not troubled with many here. From one house here lead-covered wiring (installed during the war) was removed a short time ago. It is only fair to state that the installation was replaced by the brave owner with another lead-covered installation which I think is giving satisfaction. I, however, am personally prejudiced against lead-covered wiring, and I might even go so far as to state that I am a fanatical enemy of small lead-covered wires under the floors of houses, warehouses, or any other building.

If it is necessary to use an earthed metal-covered system, which to be safe must be for ever trying to break down the insulation of the installation (and this to me does not seem common sense), then I say use a metal which is not liable to melt when the strained and weary insulation does at length peter out! By the above I do not refer to a metal conduit system, wherein no wire can possibly live for long in our climate, unless it is a 2,500-megohm grade Association aristocrat!

I like good quality cab tire, because it helps the insulated wires inside to keep their end up. In dry places I am also fond of our old friend wood casing, for the same reason.

I am aware that lead-covered systems are perfectly safe when installed, bonded, and earthed, as the advocates and makers of these systems intend them to be; but I have in my time seen such criminal jobs installed with this wire that I would hesitate to sleep over a lead-covered installation unless the patentee had actually carried out the job himself or the main switch was off!

Now, a cab tire system can be put in with safety by the jerry wireman's smallest boy, if you see that he uses the right kind of cab tire and watch what he does with the ends. Is this test, after all, not the proof of any wiring system?

A. J. Abraham, M.I.E.E.

Electricity and Tramways Department,
Aberdare.
October 31st, 1921.

With reference to the correspondence in the current issue of your paper, I would like to say that I have always recommended an insulated lead-covered system of wiring where possible in preference to, say, the concentric system with metal-sheathed uninsulated return.

The advantages of the lead-covered system are obviously:—

1. Risk of insulation failure halved.
2. No risk of electrolytic action.
3. Cheap to install.

Lead is generally regarded as incorrodible, but I have seen cases where, in damp places *in contact with wood*, the sheath-

ing has been attacked by organic acids. These cases are very rare.

Concentric systems, in my opinion, with *uninsulated* return merely ask for trouble, especially in damp places.

W. H. F. Murdoch.

London.
October 29th, 1921.

Battery Carbons.

With reference to the letter appearing in your issue of the 28th inst. under the above heading and criticising the report of an interview with me which appeared in the *Evening Standard* recently, I should like to say that I was not quite correctly reported in one particular, viz., I did not say that the pocket-battery industry in this country depended upon imported carbon rods. What I actually stated was that a well-known firm of British pocket-battery makers was, in fact, being kept waiting for a consignment of 600,000 carbon rods which the Board of Trade alleged to be liable to the Key Industries Duty. (This ruling has now been reversed.)

I think if reference is made to the letter which the Fancy Goods Vigilance Committee of the London Chamber of Commerce sent to members of the House of Commons, it will be found that the statement made therein was in practically the same terms. I appreciate the generous allowance which your correspondent is good enough to make for Press inaccuracy. I should not presume to enter into argument on the technical question as to the relative quality of the imported and the home-made carbons. Why the manufacturers to whom I have referred buy their carbons from abroad is, of course, a matter for their judgment. But I think your correspondent will agree that it is not desirable, in any one's interest, that official interpretations of an Act affecting the business community shall be allowed to pass unchallenged if they appear to be unreasonable. This seems a sword with two edges; and I do not think that either manufacturer or importer is anxious either to see Customs delays increased, or the power of bureaucracy magnified.

Frank W. Challis,
Secretary,
Electrical Importers' and Traders' Association.

London.
October 29th, 1921.

A Suction-gas Problem.

Your correspondent under this heading on page 530 does not say whether the complaints occur just after the plant is shut down or during the time the fire is being blown up previous to starting.

We have a plant that has been running since 1915 and, at first, we had complaints (we are right in the centre of a town). Then we made arrangements to ignite the waste gas at stopping time, when the waste is gas rich in CO; this burns till the waste gases get so poor as to be incombustible.

We also got some complaints at the time of blowing up when the *suction* plant was put in, but as this merely took the place of a pressure plant that had been running for 18 years, we told the complainants that it was purely imagination, that there was no difference in this respect to what had been in existence for the last 18 years. Only one man complained, and as he left the town shortly after there was no further trouble.

With regard to the water from the scrubber, the quality of the coal used makes a considerable difference; a coal rich in sulphur will make a smelly effluent, the smell being due to sulphuretted hydrogen. Cheap coals suffer in this respect. We pass it into the town sewer and have no complaint, our drains being fitted with a ventilating pipe and fresh air inlet. We find the fresh air inlet valve wants looking to periodically on account of the gases, or fumes, from the water acting on the metal hinges of the mica valves.

D. G. T.

October 29th, 1921.

Patriotism and Unemployment.

I have been much surprised during recent months at the regular way in which vacant appointments are given to men already in positions. Surely, during the present bad times at least, the proper and patriotic duty is to fill the vacancies with men who are out of employment! One would think that people who are supposed to be educated, such as electricity committee members and managing engineers of electricity supply undertakings would see to this, but I can name several appointments from engineer and manager downwards which have this year been given to men already in positions over the heads of good men who were unemployed and applied for the posts at lower salaries than are being paid; this does not help the latter, or the ratepayers to get cheap electricity, and the Government ought to intervene in the matter.

Again, is not the present mania for giving all the work to single young men being overdone? It seems hopeless for an engineer over 30 years of age to apply for a job at all; if he is married, he stands no chance whatever. I have heard of cases where first-class engineers, married, have applied for shift jobs in small stations at £5 to £6 per week and have been turned down in favour of a single young man with very little experience. Has the country gone raving mad, or where are we drifting to?

It would also appear that the electricity supply industry is getting into the hands of a ring. Who are these people called the Associated Municipal Electrical Engineers who advertised in the Review last week advising as to the salary for the post of chief engineer and manager at Long Eaton? The Long Eaton Council has been frank enough to state the salary offered, and those who do not agree need not apply for the post; it is to be hoped the Long Eaton Council will give the country a lead by selecting the most suitable unemployed engineer and never mind the A.M.E.E. or anybody else.

Wake Up England!

October 31st, 1921.

Single-phase Traction on Railways.

As the question of railway electrification is rather prominent at the moment, before any definite movement is made, it seems a favourable moment to review the merits of single-phase traction.

As is well-known, this method embodies most of the good points of d.c. and a.c. power units and transmission without their disadvantage; especially is this so on fairly long-distance schemes.

As compared with a.c.-d.c. traction, a fully single-phase system would prove a great saving to the railway companies, both in capital outlay and in running costs, since there is no need for rotary transforming stations, with their attendant personnel and running charges at definite intervals along the route. Fewer sub-stations could be used with single-phase transformers needing only occasional skilled inspection and attention.

I am aware of certain inherent difficulties in the way, but believe it possible that they may shortly be overcome, and the way be smoothed for single-phase traction to come into its own. The day seems not far distant when railway electrification will be the rule rather than the exception.

Opinions on this subject would, I think, do the industry as a whole a great deal of good.

W. T. Rushton.

Leyton.
October 29th, 1921.

The I.E.E. Rules

Is it necessary to add a d.p. switch and fuses to an ordinary flat-iron at 230 V in circuit with lights and a two-way distribution board?

Is it necessary to install a 5-amp. d.p. switch and fuses (by I.E.E. rules) expressly for a ¼-b.h.p. motor, with a starter and double automatic features at 230 V?

If the master d.p. switch and starter are on the same board, within appreciable distance of the motor, and on the same rateable value as the whole installation, can we not add some pendant 60-W lamps to the circuit to the extent of 5 amps?

Pilot.

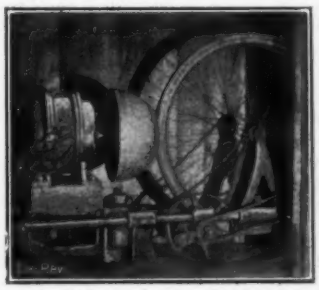
October 28th, 1921.

A.C. Organ Blowers.

In view of the interest taken in the above correspondence, I send herewith two photographs (obviously taken by naked arc light) showing a blowing device for adaptation to hand-blown apparatus, which I believe is commercially marketed, though I do not know by whom.

The motor is of ¼-h.p. of the single-phase squirrel-cage induction type, supplied at 200 volts, 100 cycles, and running at 1,900 r.p.m.

The hemisphere on the shaft engages with the tire on the cycle wheel, which drives through cycle-chain reduction gear a slowly rotating crank, connected to the blowing handle.



The carrier on which the motor is mounted is pivoted just below the hemisphere in a line with its centre, and the outer end is borne by a roller running on a quadrant.

By means of a wire attached to the main reservoir in the organ, the whole motor is swivelled round as the reservoir deflates, and so causes a wider part of the hemisphere to make contact with the tire, thus raising the gear, as shown in the second photograph. The return is effected by the spring seen in the foreground. Means are provided for slackening the wire for starting up, &c.

The apparatus is enclosed in a double-walled case, packed with sawdust, which makes it practically silent. Sufficient ventilation occurs to prevent overheating.

If run light very much, the tire suffers considerably from the twisting action of the hemisphere, and emits a squeaking noise.

One would think that a driver which came to a point on the shaft and curved out to a shape approaching that of a disk (the pivot being placed at one side of the shaft) would overcome this difficulty and also give the maximum rate of rise of gear at full load when the reservoir is lowest, just when it is most needed.

F. J. A.

Derby.
October 24th, 1921.

[This device, known as the "Rotasphere," was described in our issue of December 17th, 1909, p. 976. The hemisphere was of aluminium. The makers were the Kinetic Co., Ltd., Lincoln.—Eds. Elec. Rev.]

I have read with interest the letters on this subject, and as it is not a job that the average electrical engineer meets, it may be of interest to tell how I got over an interesting but tricky installation that I found whilst canvassing for work about two years ago.

A gentleman wanted an organ-blowing and automatic pumping plant. He had had two estimates, both of which specified for two motors, one motor on the blower and one motor on the pump, but he wanted only one motor to operate both if possible. Supply pressure 100 volts, 50 periods, single-phase; organ, 3-manual in drawing room; position for blower, motor, and pump in cellar under scullery, about 25 ft. from the organ, with 7 angles; the pump to be automatic and the blower to be controlled from the organ.

The following is what I specified and installed: Century motor, Rotary Co. pump, running at 350 to 400 r.p.m., Roots blower running at same speed, one air chest, one double-pole float switch, and double-pole change-over switch.

The pump and blower were mounted pulley to pulley (pulleys same size) and the motor pulley (wide) in line with the centre of the other pulleys for an endless belt drive. The motor when pumping was controlled by the float switch, which gave an automatic supply of water. The motor when blowing was controlled by the change-over switch fixed at the side of the organ, which cut out the float switch. The belt was changed from one pulley to the other by striking gear connected by rods and cranks to a lever at the side of the organ. The wind was controlled by the air chest, which had two valves, an electric valve operated by contacts on the organ bellows and a safety valve operated by the bellows of the air chest in case the electric valve failed. The safety valve in the organ bellows was also left in operation, but by releasing the wind at the air chest in the cellar with the electrically-operated valve, it stopped the hissing of escaping air at the organ. We installed a metal wind trunk first, but the metal pipe carried all the noise of the blower and motor to the organ; we replaced it with a wood trunk and put a felt box over the blower, after which you could not hear the motor or blower at the organ.

There is also on the market a patent blowing apparatus for connecting direct to the lever of the organ bellows, consisting of a motor on a turntable with a turned wood hemisphere on the spindle and a cycle wheel. This apparatus is suitable for alternating or direct current.

George T. Church.

Chertsey.
October 24th, 1921.

Wear of Rotary-Converter Slip-rings.

A correspondent over the *nom de plume* of "Koocaf" asked, through the hospitable "Correspondence" columns of the May 20th Review, for advice about rotary-converter slip-rings. The writer, and also Mr. B. T. Smith, offered a hint or two, and would be very glad to hear further from "Koocaf," and hope that this will catch his eye, and that he will be able to express himself as satisfied.

W. G. Stuart.

Trethomas.
October 25th, 1921.

Thunderstorm Phenomena.

With reference to the above subject, whilst in South Africa some years ago the writer had similar experiences as follows:—

1. A corrugated-iron building was efficiently earthed in four places, and had a telephone fitted therein. The instrument was protected by a lightning discharger fixed immediately above it. Some excitement was caused one evening during a thunderstorm just as dinner was being served. A servant was passing the telephone, which was fixed in a passage, when a flash and loud report occurred. The servant dropped the tureen he was carrying and ran. The writer, on making an examination, discovered that the earth wire from the discharger was taken through a small window near by and laid along the roof of the passage and connected to a water tap about 50 feet distant.

He is of the opinion that the lightning discharge flashed over between the discharger and the building in preference to following the path provided *via* the earth wire. Holding this opinion, the discharger earth wire was removed from the water tap and connected to the building, the length of earth wire being now reduced to not more than 3 or 4 feet. No further trouble was experienced.

2. The occupant of a corrugated-iron bungalow wired throughout in wood casing complained of the large number of breakages of metallic-filament lamps therein.

The breakages were at first attributed to an inferior type of lamp supplied. After paying very heavily for lamp renewals, it was reported by the occupant that he had observed that the broken lamps were invariably discovered on switching on at dusk, and after there had been a thunderstorm during the day.

After this discovery he had given instructions that on the approach of a thunderstorm during the day, lamps were to be removed from their holders, and by so doing he was saved some expense in lamp renewals.

The supply in this instance was underground, d.c., 3-wire system, 240 volts outer to neutral.

The writer not being satisfied, made an inspection, and discovered that the bungalow, built on brick piles, had not been earthed. The building was earthed, and this is believed to have cured the trouble.

As for an explanation, one can only suggest that in this instance a charge was induced in the internal wiring of the building; one side being connected to the neutral, a path was thereby provided for neutralising these induced charges *via* the lamps and flashing over switch breaks.

To avoid a repetition of the trouble at Alverstoke, Hants., the writer suggests that:—

1. The telephone earth wire appears to have inductance, possibly due to the numerous angles through which it passes. A shorter or more direct route should be chosen.

2. Assuming that the earth wire of the telephone discharger has inductance, the lightning discharge flashed over between the lightning discharger and the electric light distribution box and thence to the neutral of the 3-wire supply, on account of the neutral offering a path connected with earth and of less inductance.

M. E.

Sheerness.
October 25th, 1921.

Grinding v. Turning Commutators.

My attention has been drawn to the above correspondence, and I think it would be as well to draw the two gentlemen's attention to the fact that the simplest way of truing up a commutator is to use a hand-grinding block for ridges, flats, of high micas. This block can be obtained at a mere fraction of the cost of any of the other methods, and the block is so constructed that it will not glaze with the copper, as a carborundum block will do; the only thing necessary is to have a block suitable for the diameter of the commutator, and to apply it as soon as there is any sign of ridges, flats, or high micas.

Don't leave it till you have a commutator like a ploughed field.

Andrew A. Hurry,
For the Commutator Grinding Block Co.

Greenock.
October 31st, 1921.

[Other letters are unavoidably held over.—Eds. Elec. Rev.]

Wireless Control of Fog Signals.—A wireless development of interest to seafarers has resulted from the demand for a means of controlling fog signals off the coast and at the mouths of estuaries. This afforded a somewhat unusual problem, since to be of use the receiving apparatus must be capable of functioning without any adjustment or attention for long periods. Also it must operate without fail when required, and must not be liable to accidental operation by wireless signals other than those to which it is designed to respond. The practical solution has been provided by a combination of an improved form of the otherwise obsolete coherer acting in conjunction with a tuned mechanically oscillating relay. A wireless transmitter, suitably situated on shore, is caused to send out a series of "dots" by means of a controlling pendulum to which the receiver relay is tuned. The dot signals are received upon a small aerial on the fog gun or beacon, and each dot acting on the coherer causes a local current to apply an impulse to the tuned relay and, at the same time, to operate a tapper which provides the necessary decohering action. The relay is thus caused to swing through an arc which increases with each impulse until the relay contacts meet and the gas valve or other mechanism is operated. Apparatus of this description is to be found in the Clyde, where the fog guns at Fort Matilda and Roseneath Patch are operated from Gourock Pier. It is understood that the system is entirely satisfactory and has demonstrated its immunity from interference under exceptionally adverse conditions.—*The Times Trade Supplement.*

BUSINESS NOTES.

Bankruptcy Proceedings.—Frederick Charles Nichols, trading in partnership with Margaret Parks, as the Scarborough Motor & Accessories Supply Co., 19, South Street, Scarborough, Yorkshire, electrical and motor engineer.—The public examination of this debtor was held on October 25th at Scarborough. The statement of affairs showed liabilities £372 against assets £26. The examination was closed.

George Williams Endall, trading as Endall & Co., Canal Motor Works, Canal Bridge, Church Street, St. Helens, Lancashire, electrical, mechanical and automobile engineer.—The first meeting of the creditors of the above was held recently at the offices of the official receiver, 11, Dale Street, Liverpool. The receiving order was made on debtor's own petition. According to the statement of affairs the unsecured liabilities amounted to £1,393, against net assets £338. The assets comprised stock in trade, machinery, and good book debts. Debtor attributed his failure to bad trade and illness. It appeared that after having been in the employ of an engineering firm in Manchester for two years, he went to St. Helens in February, 1915, and commenced business as an electrical, mechanical, and automobile engineer with about £15 capital. For the first two years he was successful, but subsequently he was ill, and on his return to the business he was obliged to obtain financial assistance from a friend, who lent him £200. As security he signed an agreement which purported to give a charge over his plant, tools, and stock in trade. The £200 with interest was still owing at the date of the receiving order, and the creditor had proved as being unsecured for the amount. In April, 1918, debtor removed to his present address, where he traded until January, 1920, when he took a partner, who provided £500 capital. Debtor stated that at this time his own capital consisted of stock and business effects valued at £2,000. The partnership lasted until May, 1920, when the partner retired. In order to repay the balance of capital to the outgoing partner the debtor obtained a loan of £540, for which he gave a promissory note for £600, payable in 12 months. He stated that he had since repaid about £170. Debtor became aware of his position in July, 1920, but continued in the hope that the business would improve. At the time of the receiving order two creditors had obtained judgment against him for £480, and three were suing him. The creditors decided to appoint Mr. F. T. P. Deyes, C.A., of 51, North John Street, Liverpool, as trustee of the estate. The following are creditors:—

	£		£
J. A. Gamble	650	H. Stowell	220
Howard & Appleton	13	Watkinson	25
E. Craven	15	Beardsall & Co., Ltd.	12
Hall & Hall...	16		

J. Jones and J. R. Jones (Jones & Son), electrical engineers, 7, Chapel Street, Penzance.—First and final dividend of 9s. in the £, payable November 8th at the trustee's (Mr. W. C. Pezzack) office, Public Buildings, Penzance.

J. Jones (separate estate), electrical engineer, carrying on business in co-partnership with J. R. Jones (J. Jones & Son) at 7, Chapel Street, Penzance.—First and final dividend of 20s. in the £ payable November 8th at the trustee's (Mr. W. C. Pezzack) office, Public Buildings, Penzance.

E. S. Elam and J. Walton (Elam, Walton & Co.), electricians, Kingston-upon-Hull.—Trustee (Mr. G. H. Acheson, O.R., York City Bank Chambers, Hull) released October 17th.

F. J. Martland (F. Martland & Co.), electrical engineer, Albion Yard, Millgate, Wigan.—Receiving order made October 25th on debtor's own petition.

J. V. Bell, electrical engineer, 21, North Bar Within, Beverley, Yorks.—First and final dividend of 6s. in the £, payable at Victoria Chambers, Bowlalley Lane, Hull.

F. A. S. Wormull (Lewisham Electric Wiring Co.), electrical engineer, 273, High Street, Lewisham, S.E.—Receiving order made October 26th on debtor's own petition. First meeting, November 8th, at 29, Russell Square, W.C. Public examination, November 15th, at the Court House, Greenwich, S.E.

F. J. Martland (F. Martland & Co.), electrical engineer, Albion Yard, Millgate, Wigan.—First meeting, November 8th at the Official Receiver's Offices, Liverpool. Public examination, November 15th, at the Court House, Wigan.

Reduction of Capital.—Compania de Electricidad de la Provincia de Buenos Aires, Ltd.—A petition for confirming the proposed reduction of the capital of the company from £825,000 to £562,500 is to be heard by the High Court on November 15th.

Company Liquidations.—Phonophone Construction Co., Ltd.—Winding up voluntarily. Liquidator: Mr. T. Jones, Broad Street House, New Broad Street, E.C. Meeting of creditors was called for November 3rd.

Telephone Manufacturing Co., Ltd.—Meeting November 28th, at 2 and 3, Norfolk Street, W.C. 2, to hear an account of the winding up from the liquidator, Mr. C. W. Rooke.

Guildford Electricity Supply Co., Ltd.—Winding up voluntarily. Liquidator: Mr. B. D. Holroyd, 6, Great Winchester Street, E.C.2.

Mersey Electrical Engineering Co., Ltd.—Meeting of members called for November 30th at 24, North John Street, Liverpool, to hear an account of the winding up from the liquidator, Mr. T. L. Hanmer.

New Process Electrical Lamp Co., Ltd.—Winding up voluntarily. Liquidator: Mr. W. S. Deyes, 10, Cock Street, Liverpool. Meeting of creditors, November 11th.

Dissolutions of Partnership.—Pengilly & Burgess, electrical engineers, 6, Ormonde Buildings, Station Road, Epsom.—Messrs. H. W. Pengilly and G. F. Burgess have dissolved partnership.

Electric Block Co., electric block makers, Gaol Lane, Halifax.—Mr. S. Fowler, Mr. A. Hoyle, and Mr. F. E. Crowther have dissolved partnership. Mr. Crowther will attend to debts.

Brayne & Thomas, electrical engineers, 106, Walm Lane, Cricklewood.—Mr. G. E. Thomas and D. H. Brayne have dissolved partnership. Mr. Brayne will attend to debts and continue the business.

Trade Announcements.—The registered office of the English Electric & Siemens Supplies, Ltd., has been transferred to the company's city premises, 38 and 39, Upper Thames Street, E.C. 4. All communications should be sent there.

Mr. E. Pickbourn (The G. & P. Eletcrical Co., electrical factors and importers), 29, Heathcote Street, Nottingham, wishes to receive catalogues and price lists.

The lease of their premises having expired, Messrs. Albert C. Hands & Sons have removed their offices and showrooms to 57, Shoe Lane, Charterhouse Street, London, E.C. 1. Telephone No.: Holborn 215.

Messrs. Warren Bros. (J. W. F. Warren and S. N. Warren, founders of Warren, Beattie & Co., Ltd.) have started in business as electrical engineers and manufacturers' agents at Prudential Chambers, Middlesbrough. The principal manufacturers whom they will represent will be the Ateliers de Constructions Electriques de Charleroi. They will also carry large stocks of wires, cables, and motors.

The Gorwall Trading Co., of 40, Shaftesbury Avenue, London, W. 1, are the sole agents in the British Empire of Messrs. Kieserling & Albrecht, for all kinds of metal-working machinery.

Messrs. Medway's Safety Lift Co., Ltd., of London, have just opened a new branch office at 131, Oxford Road, All Saints, Manchester (telephone No.: Central 1764), with a special staff of skilled engineers.

Catalogues and Lists.—The "Coventry" Chain Co., Ltd., Spon End Works, Coventry.—An illustrated pamphlet describing "The Coventry" chain coupling.

Simplex Conduits, Ltd., Garrison Lane, Birmingham.—A well-illustrated and priced booklet dealing with "Plexsim" fires, including a "projector" bowl fire. Also a showcard dealing with the latter.

Messrs. Higgs Bros., Sand Pits, Birmingham.—"Monthly Magazine" for November, containing the usual features and including particulars of solid and stranded copper conductors—B.E.S.A. specification.

The Brompton & Kensington Accessories Co., Ltd., 254-260, Earl's Court Road, S.W.—An illustrated catalogue of electrical cooking and heating apparatus, including ovens, urns, hot plates, fish fryers, &c. Also a booklet of testimonials from clients.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., Blomfield Street, London Wall, E.C. 2.—List W.O. 1, an illustrated pamphlet giving particulars and prices of 500-V switch fuses for currents up to 500 A, and of porcelain handles fitted with quick-break links.

Electric Fires, Ltd., King Street, Norwich.—A well-produced catalogue giving illustrations, details, and prices of various types of fires, heaters, boiling rings, grillers, &c.

The British Aluminium Co., Ltd., 109, Queen Victoria Street, E.C. 4.—A post card for the use of inquirers for information regarding the various uses of aluminium.

Messrs. Rich & Bundy, 13, New Road, Ponders End, N.—An illustrated list of "Hot-Spot" heating and cooking appliances, including grills, immersion heaters, fires, &c. Fully priced.

The Cowper-Coles Manufacturing Co., Sunbury-on-Thames.—A booklet and a pamphlet dealing with the preservation from corrosion of iron and steel by means of the "Sherardizing" process.

The Cowper-Coles Galvanizing Co., Sunbury-on-Thames.—A pamphlet describing the Cowper-Coles electro-galvanizing process.

The Zenith Manufacturing Co., Villiers Road, Willesden Green, N.W. 2.—A priced leaflet giving particulars of "Zenite" vitreous enamelled resistance units.

Engineering & Lighting Equipment Co., Ltd., Sphere Works, St. Albans.—An illustrated and priced list of ship, dock, mill, and colliery lighting fittings.

Messrs. Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester.—An illustrated and priced pamphlet describing the "Vigil" watchman's lamp for projecting a long or wide beam.

Messrs. Charles Churchill & Co., Ltd., 9-15, Leonard Street, Finsbury, E.C. 2.—An illustrated and priced catalogue of Norton grinding wheels of numerous types, diamond tools for truing grinding wheels, oilstones, and grinding machines.

Barimar, Ltd., 10, Poland Street, Oxford Street, W. 1.—A vest pocket booklet giving examples of the efficiency of the firm's welding system, with letters from clients.

Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester.—Catalogue Section 3, illustrating numerous examples of mining type switchgear, with full descriptions and dimensions.

The Arora Co., Loughborough, Leicestershire.—A priced and illustrated pamphlet of fires and warming plates, including the "Halo" bowl fire.

Mr. S. Utting, Grosvenor Mansions, 82, Victoria Street, S.W. 1.—An illustrated publication dealing with "Thermix" air heaters and a pamphlet describing tests on one of these heaters applied to a small Belleville boiler.

The Engineers' Ballot Result.—*The Times* gives the detailed figures of the ballot vote of the engineering and shipbuilding trade unions which resulted in a majority of 22,855 in favour of the employers' proposal to withdraw the Ministry of Munitions bonus in three stages, starting November 1st.

"The figures show that the unskilled and semi-skilled workers represented by the National Federation of General Workers and the unions included in the Federation of Engineering and Shipbuilding Trades voted in favour of the reductions, while the Amalgamated Engineering Union was opposed to them. In the Federation of Engineering and Shipbuilding Trades the only large union giving an adverse vote was that of the boilermakers. The votes cast by the three main bodies were:—

	For.	Against.
General Workers' Federation	58,299	26,837
Amalgamated Engineering Union ...	48,976	66,682
Engineers and Shipbuilders	49,595	47,312

The total represents about 20 per cent. of those entitled to vote."

For Sale.—Leigh (Lancs.) Corporation Electricity Department has for sale a reversible booster set, consisting of a 55-h.p., 440-V, d.c. motor, direct coupled to two boosters.

Winchester Corporation Electricity Department has for disposal a quantity of Venner street lighting time switches.

Leek Urban District Council has for disposal two Andrews 100-b.h.p. horizontal gas engines direct coupled to two 50-kW d.c. dynamos. (For full particulars see our advertisement pages to-day.)

Inquiries.—*Impulse or Solenoid Operated Switch.*—A correspondent seeks information as to the makers of an "impulse" or solenoid operated switch suitable for switching on motors up to 10 h.p. on a 200/400-volt, 50-cycle a.c. supply. The switch is to be controlled by push buttons some distance away. A contactor type switch is not desired owing to noise, the motors being used for organ blowing.

Electrically Heated Shaving Pot.—We are asked for the manufacturers of a porcelain electrically heated shaving pot of the immersion type, the heating element being fixed on the underside of the lid.

Ceiling Fan.—Makers of the "Export" ceiling fan are asked for.

Forthcoming Exhibitions.—The following exhibitions are being organised:—

London.—November 17th to 25th, Public Works, Roads and Transport Exhibition; February 27th to March 10th, 1922, British Industries Fair; March 1st to 25th, 1922, Ideal Home Exhibition.

Birmingham.—February 27th to March 10th, 1922, British Industries Fair.

Cardiff.—May to October, 1922, Welsh National Exhibition.

Belgium (*Brussels*).—April 3rd to 19th, 1922, Commercial Fair.

France (*Lyons*).—March 1st to 15th, 1922, Spring Fair.

Holland (*Amsterdam*).—November 25th to December 26th, International Electrical Exhibition. (*Utrecht*).—February 21st to March 3rd, 1922, International Fair.

Spain (*Barcelona*).—March 15th to 25th, 1922, Samples Fair.

United States (*New York*).—January 15th to 25th, 1922, General Merchandise Fair.

Rebate in Spanish Customs Duties on Machinery.—The Spanish Embassy announces that as a result of information put before the Ministry of Finance, a Royal Order, dated October 22nd, 1921, published in the *Gaceta de Madrid* of the following day, has been issued by the Spanish Government, by which the following concessions are granted:—

1. In view of the provisional character of the existing Customs duties and as an exception machinery, accessories, mechanical implements, and working tools contracted for previous to May 17th last will be considered exempt from the increased duties established by the Royal Order of May 17th last, provided the manufacturers can prove that such goods are destined to be applied or installed for their own industry. To these goods will be applied the tariff of 1911, with the subsequent modifications, including those established by the Royal Order of November 26th, 1920, up to the present date.

2. This privilege will be applied as much to goods which are shown to have been imported since May 17th as to those which may be awaiting importation.

—*Reuter's Trade Service.*

Dockyard Discharges.—In consequence of the scarcity of work in the boilermaking and electrical engineering branches at Sheerness Dockyard, it has been necessary to issue notices for the discharge of a number of boilermakers and electrical fitters.—*Morning Post.*

Book Notices.—"Lloyds' Register of Shipping: Report of the Society's Operations during the year 1920-21." London: Lloyds' Register of Shipping.—This report contains details of shipping classified during the year, &c.

"The Geology and Mineral Resources of the Serb-Croat-Slovene State," by D. A. Wray, B.Sc., F.G.S. (107 pp. with maps and diagrams.) London: H.M. Stationery Office (F.E. 383). Price 3s. 6d. net.—This is the report of the geologist attached to the British Economic Mission to Serbia. The coal and iron ore resources are exhaustively dealt with, and notes on the state of the workings are included.

"Absolute Measurements in Electricity and Magnetism," by A. Gray. Second edition, pp. xix+837; 260 figs. London: Macmillan & Co., Ltd. Price 42s. net.

"Elektrische Fördermaschinen," by Prof. W. Philippi. Leipzig: S. Hirzel.

"Radiations from Slow-Radium," by John B. Kramer, with a note on their therapeutic value, by John Hall-Edwards. Pp. 105; 53 figs. London: Baillière, Tindall & Cox. Price 12s. 6d. net.

"The English Electric Journal," Vol. I, No. 7, July-October, 1921. London: The English Electric Co., Ltd. Price 1s. net.—This number contains "Reflections on Unemployment," "Mechanical Advantages of Electric Locomotives compared with Steam," by Sir Vincent Raven, K.B.E., a description of a motor installation in a large textile factory, by J. S. Randles, A.M.I.E.E., and other interesting articles.

"Questions and Solutions in Magnetism and Electricity," by W. J. White. Pp. 108. London: S. Rentell & Co., Ltd. Price 2s. 6d. net.

We have received the first number of "Electrical Wonders of the World," by F. A. Talbot, a new serial publication published by Cassell & Co., Ltd., to be completed in 24 fortnightly parts at 1s. each net.

The Swiss Oerlikon Engineering Works.—The accounts of the Maschinenfabrik Oerlikon, for 1920-21, show net profits of 1,001,000 fr., as compared with 2,086,000 fr. in the previous year. The investment account has risen from 915,000 fr. in 1919-20 to 1,355,000 fr. last year, the increase being in connection with the company's participation in an English company which took over the Swiss company's sales' bureau in London.

Advance in German Prices.—The Berlin Osram Co., on October 21st, issued a notice intimating that the war-time surcharge of 250 per cent. on the list prices would be increased to 300 per cent. as from October 20th, in consequence of the constant rises in wages and raw materials. Orders on the books at that date will be executed in accordance with contract conditions at the surcharge of 250 per cent. until November 30th, but those not carried out by then will be subject to the additional 50 per cent.

The Foreign Trade Department for electrical manufactures announces that in accordance with the change in circumstances, electric heating and cooking appliances can now only be sold in foreign currency to countries having a high exchange, and export permits will only be granted to firms who comply with this condition. The export prices for galvanic batteries and elements, as well as for other electrical articles, have been substantially increased.

Consolidation of Interests in Saxony.—It is proposed to consolidate various companies in Saxony, in which the State of Saxony holds a dominating interest through its shareholding in the Elektra Co., of Dresden. The Zwickau Electricity and Tramway Co., the Vogtland Electricity Works Co., of Bergen, and the Erzgebirg-Vogtland Tramway and Electricity Co., of Annaberg, which are subsidiaries of the Elektra Co., are to be amalgamated by the Zwickau Co. absorbing the two other concerns and assuming the title of the West Saxony Power Works. The transaction will involve a large increase in the share capital of the absorbing company, and part of the augumentation will be taken over by the Elektra Co. and the State of Saxony. In addition, an increase in the share capital of the Electricity Works Operating Co., of Riesa, is to be made, a portion of which will also be subscribed by the Elektra Co., which in turn is raising its capital from 10 to 25 millions of marks for the purpose of completing the transactions in question.

Wanton Lamp Breaking.—Two boys were ordered to pay 5s. each at Bridgend for breaking electric lamps by throwing stones at them. Mr. A. Adams, secretary of the Ogmore Valley Electric Light Co., stated that a great deal of similar damage had been done recently, the company having to replace 50 lamps within three months.

Unemployed Engineering Workers in Switzerland.—Unemployed on September 30th numbered 136,067, of whom 33,000 were in the watchmaking trade and 29,000 in engineering.—*The Times.*

Kohler Lighting Set.—Correction.—With reference to the description of the above-named automatic electric lighting set in our last issue, some confusion may arise out of our reference to Mr. C. H. Cook as the firm's London representative. We understand that Mr. Cook is the service engineer and that Mr. Washington B. Clarke is the firm's London manager.

Board of Trade Committees.—We extract the following particulars and addresses (revised up to date) from the *Board of Trade Journal*.

Committee.	Secretary.	Headquarters.
Advisory Committee for the Clearing Office (Enemy Debts) and the Departments for the Administration of Austrian and Bulgarian Property.	A. H. Hannay	Cornwall House, Stamford Street, S.E. 1.
British Industries Fair (Exhibitors' Advisory Committee).	J. A. Stirling	2, Queen Anne's Gate Buildings, S.W. 1.
British Industries Fair (Joint Consultative Committee, London and Birmingham).	J. A. Stirling	2, Queen Anne's Gate Buildings, S.W. 1.
Electrical Communication with Lighthouses Committee.	R. H. Haylett	Merc. Mar. Dept., Lake Buildings, St. James' Park.
Metalliferous Mining Industry, Advisory Committee for the.	F. C. Starling	46, Victoria Street
Miners' Lamps Committee	E. G. Fudge	46, Victoria Street
Mining Dangers Research Board ..	E. G. Fudge	46, Victoria Street
Overseas Trade Credits Advisory Committee.	A. C. Cruttenden	73, Basinghall Street, E.C. 2.
Water Power Resources Committee ..	T. Turner.	Gt. George Street

"Pytram" Lighting Fittings.—The Pytram Manufacturing Co. is showing a selection of "Pytram" lighting fittings in rooms at 63, Queen Victoria Street, E.C.4. "Pytram" is a material similar to papier mache but lighter and stronger. The fittings consist principally of shade rings in old metal and wood finishes carried out in imitation of Grinling Gibbons carvings. Indirect lighting bowls are also on view, as well as electroliers and wall brackets. The reproductions are very true to the originals, and, of course, far cheaper. The ceiling fittings should find an application to lighting, in place of heavy suspended fittings, which often constitute a source of danger.

The Austrian Electrical Industry.—The *Economic Review*, quoting a recent statement by Dr. Heinrich Schneider, says that the dismemberment of the Austro-Hungarian Empire has had but small effect upon the makers of electric lamps, wires, switches, and installation apparatus. The Austrian firms retain a close connection with the Succession States, and their activity cannot be dispensed with; nor, in view of the exchange situation, can they be underbidden. The Austrian dustry is therefore not compelled, as is even the German, to produce ever accumulating stocks, nor has any falling off tendency as yet been observed. This is partly due to the home requirements.

A further advantage recorded for the electrical industry is the repeal of the Electrical Economic Law which was so irksome to it. Henceforth, the Electricity Law will function in correspondence with the claims of the industry, and without placing upon it any undue burdens.

Trade with Canada.—Mr. Ben H. Morgan, chairman of the British Empire Producers' Organisation, who has recently returned from a visit to Canada, affirms that there is an immense field for the sale of British goods in Canada at the present moment. Last year Canadian imports from the United States amounted to $600,000,000, the bulk of which Canadian buyers would have been glad to obtain from British sources. The chief reason that they were not so obtained is that British goods are not available in Canada as and when they are required and in small parcels. The Canadian buyer is able to regard the United States as a warehouse for his supplies from which he can obtain them in small quantities or large by means of a mail order or a telephone call with delivery in a few days at most. To combat this situation, manufacturers must carry stocks in Canada and, where necessary, obtain the assistance of the Government to finance them.

Electrical Wages in Australia.—Including an increase of 9 per cent. granted in September, the new wage rates in the Melbourne metropolitan district and Geelong are as follows:—

Electrical mechanics, linesmen or wiremen, £5 8s. a week; battery erectors, £5 12s. 6d.; electrical erectors, £5 12s 6d.; cable jointers, £5 16s. 6d.; cable jointers' assistants, £4 12s. 6d.; "all others," £4 9s. 6d. Apprentices and improvers: First year, 11s. a week; 2nd year, 16s. 6d.; 3rd year, 30s. 6d.; 4th year, 41s.; 5th year, 54s. 6d.

Steam Accumulator Patents.—It is reported, as was mentioned in our last issue, that as a result of negotiations carried on for some months past between the Swedish A.B. Vapor Ackumulator and German interests, a company has been formed in Germany to work the storage patents of the former under the title of the Warmespeicher Doktor Ruths' G.m.b.H. The Swedish company holds 20 per cent. of the capital in the new company, the other parties interested being the A.E.G. representing the Rathenau group, the Deutsch-Luxemberg Mining and Ironworks Co., and the Siemens-Schuckert works for the Stinnes group, and the Augsburg-Nuremberg Engineering Co., and the Gutehoffnungshutte for the Haniel group. The direct working of the patents is being organised by the four firms in question specially for the erection of Ruths's storage installations.

The Nation's Food Exhibition.—This exhibition, which is to be held at Olympia in September, 1922, is to include the display of apparatus used in the preparation of food, and it would appear that an opportunity is presented for manufacturers of electrical cooking appliances to further acquaint the public, and especially caterers, with their productions. The exhibition is being organised by the International Trade Exhibitions, Ltd., in conjunction with the Trades' Markets and Exhibitions, Ltd., and all communications should be addressed to Broad Street House, E.C. 2.

A Local Exhibition.—A local exhibition of electrical apparatus, principally domestic, at Farnworth, comes to an end to-morrow after a ten days' run. This has been organised by the electrical engineer to the Urban District Council, and the whole of the work in connection with it has been carried out by members of the staff and their wives. A large number of well-known electrical firms are participating, and the result is a comprehensive display of domestic appliances, motors, cycle and motor-car lighting equipment, organ-blowing apparatus, lighting fittings, switchgear, &c. The electrical staff has made a number of heating and cooking tests, and so visitors are enabled to gain some idea of the performance of the appliances shown.

Engineering Discharges in Norway.—Mechanical workshops in Norway are reducing activity and discharging workmen. The situation is especially bad at Drontheim.—*Reuter's Trade Service*, Stockholm, October 25th.

Profitable Employment.—An article containing some reflections on unemployment appears in the current number of the *English Electric Journal*. The writer dwells upon the importance of productive work being given the preference over doles and relief schemes as a means of providing employment, and proceeds;—

"It is not always realised what the loss to the nation through ordinary relief work is. Take a man earning £4 a week in an engineering shop and transferred through lack of employment to relief work at the same wage. His normal employer has a clear loss, in unabsorbed establishment charges, of £5 a week, on the moderate basis of establishment charges of 125 per cent. on labour. On relief work a good tradesman is inefficient and uninterested, and of the £4 a week which he is paid probably not more than £1 on the average has any permanent value. There is therefore a loss to the nation of £8 a week through this one man being turned adrift from his normal employment. An electric power station, on the other hand, or the electrification of a railway, absorbs an enormous amount of direct labour per £ expended, and it is an important addition to the wealth and the wealth-producing capacity of the country. An examination of an actual railway electrification scheme, which would cost £6,000,000 and could not fail to produce a very high return on the money spent, shows that when every allowance is made for certain imported materials, such as copper, £4,800,000 out of the total capital cost of six millions would be spent on direct labour in this country. Nearly all the great railway companies have schemes for electrification worked out or in contemplation, but it is unreasonable to expect that the large sums of money required can be raised unless the status of this new money in relation to the present capital of the railways is safeguarded. If the Government would trust the great industries of the country by facilitating the financing of such schemes, a large number of men could be found employment at their own trades, instead of being left to the slow demoralisation of the dole or useless relief work."

The £60,000 Claim against the Sydney City Council.—The Sydney City Council had before it in September, a report of the Electric Lighting Committee regarding the claim of the English Electric Co., Ltd., already referred to in these notes. The Committee reported with regard to the claim by the English Electric Co. of Australia, Ltd., for alleged non-fulfilment of the Council's undertaking to place with the company an order for a turbo alternator set, and in respect of which a writ has been issued against the Council claiming £60,000 damages, recommending that authority be given, with a view to a settlement, for the English Electric Co. of Australia, Ltd., to be asked (without prejudice) to submit a quotation for the supply of one 12,000-kW at .85 power factor, turbo alternator set complete, with exciter, condenser, air and circulating water pumps, wet air filter or air cooler, and everything necessary and usually supplied, the whole of the plant to be delivered, erected, and ready for commercial use by March 1st, 1924, provided that the City Council has the foundations ready to receive the plant.

French Bauxite.—Since October 23rd, 1920, an export duty of 20 per cent. of the value has been levied on any tonnage of bauxite sent out of France. As a consequence the production and the deliveries from the Bouches-du-Rhone have been reduced. The Union des Bauxites, which is said to be an English company, and the Société des Terres Refractaires de Provins, in which are Swiss interests, have this year lodged action protests against the maintenance of the duty. A French newspaper states that the question is whether the necessity for protecting the aluminium industry implies the duty of prohibiting or practically forbidding the export of silicious bauxites. Another report, however, now states that the duty has been abolished.

New Uses of Rubber.—The Rubber Growers' Association has issued a booklet giving the full results of its prize competition for ideas and suggestions for new and extended uses of rubber. The competition opened in July, 1920, and closed on December 31st, 1920, about 10,000 suggestions being sent in. The prizes were (1) £1,000; (2) three prizes of £500 each; (3) ten prizes of £100 each; (4) £1,500 divisible among the remaining competitors who submitted suggestions of value. The expert adjudicators have awarded the prizes to:—suggestions for the use of sponge rubber for upholstery purposes (80 competitors suggested this, and the £1,000 prize is divided between them); suggestions for incorporating rubber in liquid form with paint for preservation of wood and metals against the action of the sea (five successful competitors); suggestions for the use of rubber in paint for general decorative and preservative purposes (nine successful competitors); suggestions for the use of rubber for the valances and mudguards of motor vehicles (eight successful competitors); and so on.

While the competition has not produced any suggestions which would appear to afford an opportunity for the realisation of the aims of the Association, *i.e.*, the exploitation of a new use which would be responsible for an immediate and marked increase in consumption, at the same time, it is felt that amongst these suggestions there must be some which, when submitted to expert technical investigation, may prove to contain substance for feasible development. The Association has decided therefore to submit all suggestions received to a panel of qualified technical men of established repute in the industry who will carefully consider the ideas. These suggestions will duly be brought before the rubber manufacturers in a series of pamphlets.

Hadfields' Australian Company.—In September there was registered in Australia a company under the title Hadfields (Australia), Ltd., with a capital of £500,000 in £1 shares, to acquire as a going concern the business, assets, and undertaking of the company registered under the name of the Australian Electric Steel, Ltd.; to carry into effect an agreement with Hadfields, Ltd., Sheffield; and to carry on the business in Australia of ironmasters, steel makers, colliery proprietors, &c.

New Steamship Service to Australia.—Steamship communication with Australia is receiving an active fillip by the inauguration of a new service of five big fast vessels specially built for the Commonwealth Government Line. Omitting Mediterranean ports, they will accomplish the voyage in at least three or four days less than other lines to Australia, including mail service lines. Improved regular speedy communication between England, Ceylon and Australia will be welcomed, both by traders and by the travelling public. The *Moreton Bay*, the pioneer of the new line, is timed to leave London on December 7th, and the other ships of the "Bay" class will follow her at four-weekly intervals. They will proceed direct from London to Port Said, thence to Colombo and Australia, calling in turn at Fremantle, Adelaide, Melbourne, Sydney and Brisbane, the terminal port.

Electrical Displays in Large Stores.—A visit to several of London's large departmental stores shows that these establishments realise that, if they wish to completely fill the *rôle* of "Universal providers," they must not neglect domestic electrical apparatus. Electrical showrooms are therefore destined to take a large place in these huge shopping centres.

Messrs. Harrod's probably have the best of these electrical displays, having devoted a good deal of floor space to the exhibition of every item in the present wide range of domestic appliances. On the first floor, in the Linen Department, some of the larger machines are demonstrated for the benefit of visitors. Here may be seen a Western Electric dishwasher, which when closed in at the top may be used as a spare table. To enable its operations to be examined, a glass top has been fitted, and prospective buyers may see for themselves how the machine works. The action of this appliance is to force water at high speed over dishes, placed in two wire racks, by means of a revolving blade. Other Western Electric productions shown are a washing machine, an ironer, a vacuum cleaner, and sewing machines. A large display of "Universal" and "Hotpoint" kettles, irons, grills, coffee percolators, &c., is also present. Six "Magicoal" fires are placed in an alcove at the back of the display. On a floor above there is another large selection of electrical apparatus. Suspended from the ceiling and arranged on tables are all kinds of lighting fittings, plain and artistic, including bowls, silk shades, table lamps, floor standards, &c. "Thor" and "Eden" washers are shown in operation, and among a large collection of other things are Benham electro-vapour heaters, "Magnet" fires, "Eureka" vacuum cleaners, &c. Some cooking apparatus is shown, but not very prominently. To aid the customer who cannot afford to spend forty or fifty pounds at once, Messrs. Harrod's have instituted a hire-purchase system by which the larger machines can be more conveniently acquired. This is an absolute necessity, and is to be commended.

The General Electric Co., Ltd., has invaded Messrs. Wm. Whiteley & Co.'s large stores and arranged a comprehensive display of appliances for the firm. Nearly all of the well-known "Magnet" productions are represented. One small 2,200-watt oven shown has a hotplate let into the top with two 700-watt elements. The main cooking element is in the bottom. Other exhibits are bowl fires, ornamental fires, grills, irons, blowers, cigar lighters, &c. A new piece of electrical furniture is exhibited for the first time. This is an oak cabinet having an aluminium-covered platform which can be let down on four guides into the cabinet. Upon this table are arranged a three-heat grill and two plugs for putting a toaster and a kettle or other appliances into circuit. The cabinet is on wheels, permitting it to be easily moved from room to room. A "Time Saver" washing machine is running. This is a "dolly" type machine, with a wooden container and simple gears, which, it is explained, can be run from a lampholder. (This, by the way, should not be encouraged!). Lighting fittings are also shown as well as examples of neon lamps and "Atrax" projectors.

Messrs. Selfridge's show is cramped into a rather small space, and the appliances are therefore not seen to the best advantage. Nevertheless, the display is fairly comprehensive so far as the smaller appliances are concerned. "Quead" and "Cosmos" fires, "Hoover" vacuum cleaners, toasters, grills, saucepans, &c., occupy most of the space. A special line of lighting fittings is shown. This consists of painted vases with lampholders fixed in the top. Numerous other lighting fittings are suspended from the ceiling, and torches, pocket lamps, and small batteries are shown in profusion.

We hope that the exhibition at Harrod's will be made a permanency, and that the other large stores will come into line with it.

New Belgian Companies.—There has been formed at Brussels (13 Rue Brederode) the Société Nationale Radio-Electrique for commercial, industrial or financial operations connected with telegraphy and telephony. Capital, 500,000 fr.

At Sarrebruck has been embodied the Elektro-Werke Sarrebruck, with a capital of 2,250,000 marks.

New Italian Companies.—The Società anonima Fiumana per Radio Communicazioni has been formed at Fiume for the construction of wireless stations. Signor Guglielmo Marconi is the president.

At Milan has been established the Società anonima Siemens with a capital of 2,500,000 lire. Of the six directors, half are Germans.

The Consorzio per l'Elettrotrazione has been constituted at Turin, the greater part of the capital being put up by the F.I.A.T.

New French Companies.—Under the style of Boiteux et Bucquoi has been formed at Paris (326 Rue des Pyrénées) a company to work the goodwill of a business for the manufacture and sale of all kinds of electrical appliances and apparatus. The capital is 170,000 fr.

The Scierie Hydro-Electrique du Val Vernier is a newly formed saw-milling company, which proposes to utilise a waterfall on the Upper Marne for the generation of electricity for the purposes of its business, which also includes the drying of timber by a special method. Its capital is 2,000,000 fr., and its offices are at 12 Rue Castex, Paris.

Berthon et Touzot, Société d'Installations et Constructions Electriques et Mécaniques is a company recently formed at Boulogne-sur-Seine (Rue d'Aguesseau 40), with a capital of 100,000 fr.

Under the title of the Secteur Electrique de la Vallée d'Auga, a company has been formed at Orbec (Calvados) with a capital of 750,000 fr. for the generation and distribution of electricity.

LIGHTING AND POWER NOTES.

Adwick-le-Street (Yorkshire).—Electricity Supply.—The Urban District Council has decided to take steps to secure a supply of electricity for public and private lighting, and application has been made for the necessary Order. An electrical engineer is to be engaged to prepare a scheme. It is probable that the electricity will be supplied from one of the neighbouring collieries.

Bedford.—Extensions Opened.—On October 29th a new Parsons turbine coupled to a single-phase alternator was put into commission.

Belfast.—Loan.—Application has been made to the Electricity Commissioners for sanction to the borrowing of £550,000 for the establishment of a sub-station in Ballymacarrett district and extensions of existing feeders, and £52,000 for service mains, meters, &c.

Bradford-on-Avon.—Electricity Supply.—Owing to the Ministry of Transport having decided to revoke the electric lighting order granted in 1914 to Mr. J. H. Edwards, the Urban Council has appointed a committee to consider the question of a supply of electricity for the town.

Brighton and Hove.—Electricity in Bulk.—The laying of new cables and the installation of new plant to enable the Hove electricity undertaking to obtain electricity in bulk from Brighton Corporation's station at Southwick have been completed.

Loan Sanctioned.—The Electricity Commissioners have given sanction to the borrowing of £1,224, for 20 years, for switchgear, &c., in connection with the supply of electricity to Hove.

Chester.—Supply in Bulk.—A conference has taken place between the representatives of the Chester Corporation, the Hoole Urban District Council, and the Chester and Tarvin Rural Councils regarding the supply of electricity in bulk to the urban and rural districts. The Town Clerk of Chester has been in communication with the Electricity Commissioners with regard to the formation of a joint committee for the district, and the Commissioners have expressed the view that a scheme of the kind suggested appears to be cumbersome and complex. They suggest that it would be more expeditious for the Chester Corporation to obtain a special order to extend its supply area. After discussion, it was agreed that the representatives of each authority should obtain the views of their Councils, and in the meantime the Chester Corporation should take the preliminary steps towards obtaining a special order.

Colwyn Bay.—Loan.—The Council is borrowing £42,500 for electricity extensions.

Continental.—Belgium.—It has been decided to establish a new station at Ghent, at an estimated cost of about 13,000,000 francs.

The installation of electric lighting in the commune of Exaerde, Eastern Flanders, is under consideration.

The Provincial Council of Luxembourg has devoted a session to the consideration of the question of the electrification of the province, with the result that an advance of 1,400,000 fr. at 4 per cent. has been sanctioned for the installation of two distributing networks for light and power in the Arthus-Arlon-Virton and the Bouillon-Bertrix-Paliseul-Neufchâteau districts respectively. Use will be made of energy supplied from blast-furnaces at Holanzy to meet immediate demands. The partial use of the plants left by the Germans is proposed. The general electrification of the province will be undertaken shortly.

Czecho-Slovakia.—With the financial co-operation of the Czecho-Slovak Government, the Western Slovak Electrification Co. has been founded with a capital of 8 million kronen, which is to be increased to 16 millions in the course of the next three years. The first object of the new company is the electrification of the Bratislava (Pressburg) district.—*Reuter's Trade Service* (Prague).

The *Journée Industrielle* learns from Prague that the Ministry of Public Works is about to establish at the Hedwig pits in the coal district of Most (Bruew) large electric works which will furnish power to Prague and Central Bohemia. The cost is estimated at 150 million crowns.—*Reuter's Trade Service* (Paris).

Upper Silesia.—The decision of the Council of the League of Nations, regarding the division of Upper Silesia as between Germany and Poland, stipulates that where the whole of a water, electrical, or other system is not included in one of the divisions, this system shall be maintained as before except in the case of a special agreement between the two parties.

Norway.—As in Switzerland, the abnormally dry year has caused a serious shortage of water, and many hydro-electric works have been compelled to suspend operations.

Sicily.—A message from Rome says that the Technical Commission for Unemployment has approved the urgent execution of works in connection with the exploitation of the River Simeto, in Sicily, for the production of electric power. The Consiglio Superiore delle Acque has authorised a concession for this purpose, and it has also authorised a provisional commencement of the works as soon as the agreement is signed without waiting for the settlement of details. The scheme provides for the formation of an artificial lake at Valle di Aderno capable of storing a hundred million cb.m. of water. The total expenditure, exclusive of work in connection with bringing land into cultivation, is estimated at 60 million lire. The power to be utilised is calculated at 14,000 h.p., while 35,000 hectares of land will be irrigated and cultivated.—*Reuter's Trade Service* (Milan).

Deal.—Lighting Orded Abandoned.—The Deal & Walmer Gas and Electricity Co. has informed the Town Council that owing to the altered financial condition since the powers were obtained, and the high prices now ruling for machinery, &c., it has decided not to carry out its powers under the Electric Lighting Order.

Electricity District.—Mid-Lancashire.—The Electricity Commissioners give notice that they have for the fourth time extended the time within which objections or representations may be made or schemes submitted in connection with the above-named area, from October 31st, 1921, to March 31st, 1922.

Fermoy.—Electricity Scheme.—A deputation from the Co-operative Society explained the proposals for an electricity scheme to the Council recently. The total expenditure was given as £9,000, and the Council was asked to use its influence to obtain subscribers to the scheme. It was stated that the charge would depend upon the consumption of electricity. For an output of 40,000 kWh, 1s. per kWh would be charged, whereas if 200,000 kWh could be sold, the price would be about 4d. A special meeting of the Council is to be held to consider the proposals.

Greenock.—Electricity Scheme.—An experiment on the utilisation of waste steam for the generation of electricity has been agreed upon by Greenock Corporation. The generating plant, which will be of 1,500 kW capacity, is to be set up in the Glebe Sugar Refinery, and will remain the property of the Corporation. The steam is to be supplied by the Refinery, which will secure all power and lighting requirements free of charge. The surplus, estimated at about 900 kW, will be given to the Corporation. The experiment is expected to reduce costs both at the Refinery and at the Corporation Electricity Department.

Hemsworth.—Electricity Supply.—The Urban Council has decided to ask the Yorkshire Electric Power Co., Ltd., for terms upon which it would supply electricity to the district.

Hurst.—Electricity Supply.—The Council proposes to apply for a Special Order for the supply of electricity in the district, and afterwards to transfer it to the Ashton-under-Lyne Town Council, provided the latter body agrees to pay all costs.

Holsworthy.—Semi-public Lighting.—A novel lighting scheme has been instituted by the Holsworthy (Devon) Urban Council. The tender of the local gas suppliers for public lighting being considered too high, the Council has asked householders who possess outside electric lamps to switch them on at night during the winter months, and the expense will be re-imbursed to them at the end of the season.

Luddendenfoot (Yorkshire).—Electricity Supply.—The public electric lighting in Luddendenfoot, supplied by the Yorkshire Electric Power Co., under agreement with the local District Council, has commenced. Arrangements for electric lighting in the Boulderclough district have also been completed, and other outer districts of the Council's area will be lighted as fast as the cable-laying, &c., is completed. The whole scheme is on the time-switch system.

Littleborough.—Loan Sanctioned.—The Electricity Commissioners have sanctioned the borrowing of £8,500 for electricity purposes in respect of the £9,000 applied for, pending receipt of particulars as to the approximate cost of the work.

London.—Poplar.—The Electricity Committee seeks approval for a proposal to expedite the laying of electricity mains in streets in the borough not at present supplied, in order to provide employment under the Government scheme for the unemployed. It reports that the Council authorised this extension in July, 1920, by a gradual process spread over a period of ten years. The proposal would involve a cost of £70,053, of which £33,715 would be paid for labour. The committee also proposes to submit a scheme for the conversion to electric lighting of public gas lamps at an estimated cost of £5,000, as a non-revenue producing scheme, ranking for grants of 65 per cent. of the interest and instalments for one-half the loan period.—*Daily Telegraph.*

The revenue shows a reduction of £24,000 on the previous, which is attributed to the loss on coal.

Bethnal Green.—On October 31st a new transformer substation was declared open by the Mayor (Councillor J. J. Vaughan). The building, originally a chapel, is situated at the Oval, Hackney Road, and houses, at present, two transformers, one of 250 kVA and the other of 500 kVA capacity; the station is ultimately to deal with 3,000 kVA, although there will still be ample space. Energy is brought in bulk from Stepney at a pressure of 6,000 V, and is stepped down to 415 V. It is distributed at this voltage for power; lighting is taken off one phase and a balancing wire giving 240 V. The switchgear consists of two high-pressure panels and interconnecting panel with switches of the cubicle type. The distributing board is in seven sections. The switchgear was supplied by the Metropolitan-Vickers Electrical Co., Ltd. The transformers were manufactured by the Hackbridge Electrical Construction Co., Ltd., and the cables by the British Insulated and Helsby Cables, Ltd. The station is equipped with a 10-ton crane mounted on the roof girders. At the ceremony the chairman of the Electricity Committee (Councillor J. J. Cunningham) outlined the history of the Bethnal Green undertaking, and paid a tribute to Mr. H. H. Couzens, M.I.E.E., and members of the staff for their good work. The Mayor also gave recognition to their services, and said he hoped that soon meters would be abolished and electricity would be as plentiful as water.

Battersea.—At the request of the E.T.U. and other trade unions the Electricity Committee recommends the carrying out of a number of works to relieve unemployment. These include extension and replacement of mains, and the wiring of buildings.

Hammersmith.—The electrical engineer reports that the contractors supplying the first 10,000-kW turbo-alternator under the extension scheme will be in a position to deliver it in the early part of November.

Fulham.—In response to the request of the N.J.I.C. for the cable making industry, mentioned in our "Notes" columns last week, the Electricity Committee recommends that application be made for sanction to the carrying out of cable extensions at a cost of £11,124; also that the Unemployment Grants Committee be asked to contribute to the cost.

The Electricity Committee has approved the laying of a duplicate linking-up main between the Fulham and Hammersmith undertakings. The cost is estimated at £7,500, and it has been agreed to pay a third of this, Battersea being associated with the linking-up scheme. The switchgear for the Fulham station will cost £1,000.

(*Continued on page 609.*)

ELECTRICITY SUPPLY AT SHEFFIELD.

The Blackburn Meadows Generating Station.

The phenomenal growth in the demand for electricity in the City of Sheffield and the surrounding districts during the war period is familiar to our readers. The enormous increase in the capacity of the Corporation's electricity supply undertaking will be better realised when compared with its previous progress: The undertaking commenced to supply electricity in the city in May, 1892, with the result that in March, 1914, after 22 years' working, the total plant capacity had reached the figure of 23,225 kW. The upward curve representing the growth of the number of kWh generated at the Neepsend station became nearly a vertical line, and steps were taken to add to the plant installed in order to meet the general need for electric lighting and power in Sheffield. Then on top of the natural increase in the load was superimposed the imperative call for power in connection with the manufacture of munitions of war, and within a period of less than three years arrangements had been made to augment the capacity of the undertaking to no less than 68,225 kW. During the four years 1914 to 1918 the maximum demand on the system grew from 12,519 to 58,909 kVA, the station load factor remaining practically constant at 40 per cent. during that period, and by 1920 the demand applied for had reached the figure of 164,500 kW, the plant installed had a capacity of nearly 69,000 kW, and the maximum load on the system had reached the total of nearly 61,000 kW.

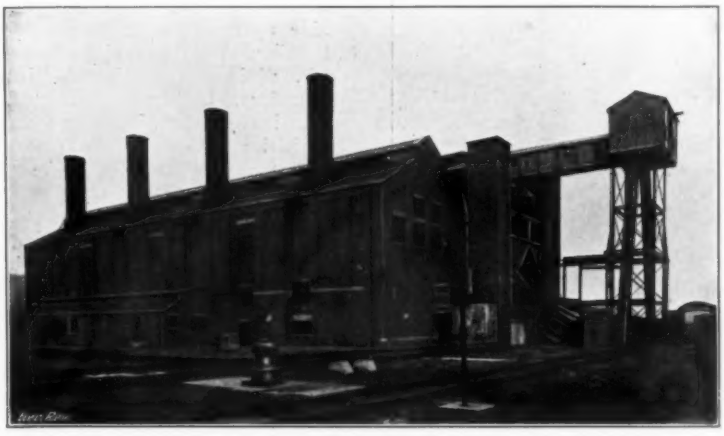


Fig. 1.—Exterior of Blackburn Meadows Station, Sheffield, Showing Coal-handling Plant.

At the outbreak of the war the Neepsend generating station site had been developed to the extent of approximately one-third of its ultimate capacity, but by April, 1916, the last of the contracts covering the extensions for the full development of the site, both as regards plant and buildings, had been placed, and nearly three years ago we described the undertaking as it then was.* But the city electricity supply undertaking under the able leadership of its general manager and engineer, Mr. S. E. Fedden, M.I.E.E., M.Inst.C.E., M.I.Mech.E., was far from being content to rest on its laurels, and even then a new station, to be of no less than 100,000 kW capacity, was in contemplation. However, for future intentions we must await the result of the local inquiry which the Electricity Commissioners are to commence at Sheffield on the 29th inst., when the Corporation will outline its scheme for the reorganisation of the supply of electricity in the North-East Midlands Electricity District and for the formation of a Joint Electricity Authority for the area.

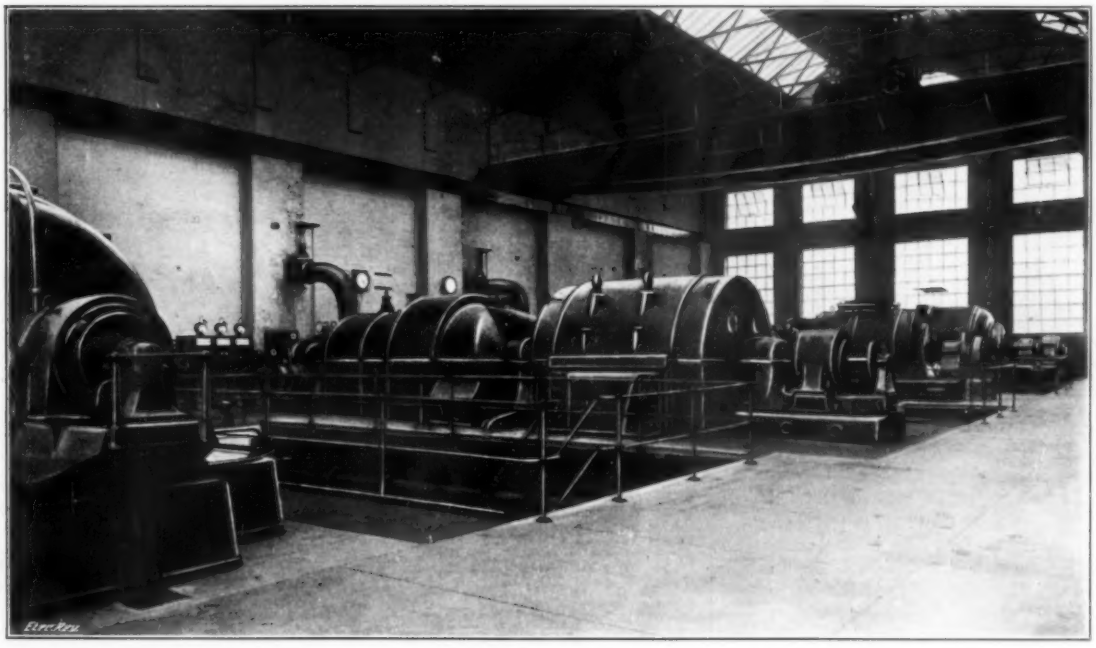


Fig. 2.—Turbine Room.

To return to the period under consideration, the

* Electrical Review, January 3rd and 10th, 1919.

demand for electricity continued, and it soon became apparent that the additional plant would be insufficient to meet the evergrowing need for more power. Accordingly in the summer of 1916 the Electricity Supply Committee authorised a search for a suitable site for a new generating station to be made, and an area of approximately 27 acres adjoining the City of Sheffield sewage disposal works was finally decided upon in October, 1916. The site is at the extreme eastern boundary of the city, and is situated close to many of the large local steel works. At this stage, however, an obstruction was met with in the form of a refusal of the Ministry of Munitions to permit the work to proceed, and the original proposals were, therefore, cancelled. This action of the Ministry resulted in a delay of 12 months, and consequently a start on the erection of the war emergency generating station was not made until November, 1917. The Blackburn Meadows station, as it is known, of which fig. 10 is a plan, is now almost complete: turbo-generating and boiler plant with a total capacity of 35,000 kVA has been installed, and the station was to be opened by H.R.H. the Duke of York this morning. Actually, however, a portion of the plant has been on load for the past 12 months; a large proportion of the energy generated is delivered to Sir R. Hadfield's adjacent works for power purposes and for consumption in electric furnaces. The station is interconnected with that at Neepsend, so that no night shift is worked at Blackburn Meadows at present. Incidentally, no smoke issues from the stacks while the boilers are on load; if it should do so it is a sure sign that the furnaces have been banked.

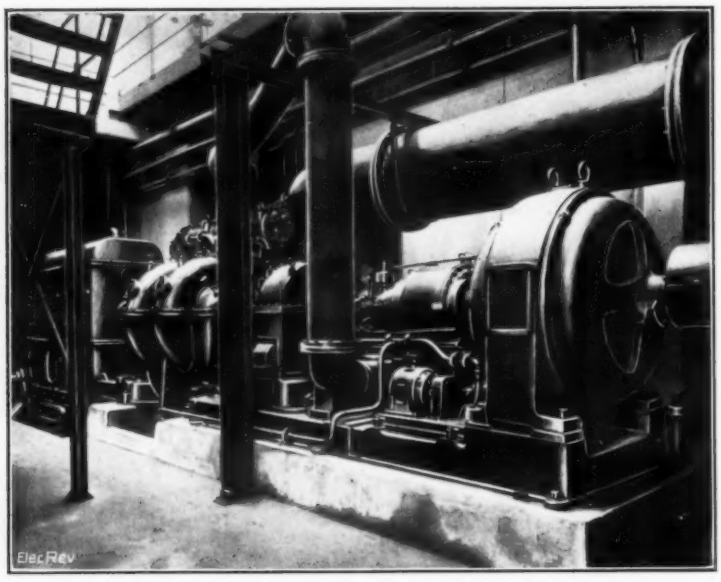


Fig. 3.—Condenser and Auxiliary Gear.

When the contracts were finally placed it was found that in addition to the delay in putting the work in hand other serious disadvantages had resulted from the action of the Ministry of Munitions—the situation was aggravated by the increased shortage of labour and by the substantial advances in rates of wages and cost of materials that had taken place between 1917 and the date of completion. In place of the original proposals the Electricity Committee bought the boilers and generating plant which had been manufactured to the order of the Government for the Henbury Explosive Factory, and although the plant is not of the size and type that the Corporation would have ordered in normal circumstances, yet the Corporation considered itself fortunate in being able to acquire equipment that was in the final stages of completion and, moreover, at a price considerably below that at the time obtaining in the open market.

The splendidly situated site is level and surrounded on three sides by main-line railways, whilst the sidings of the Sewage Disposal Department were already in existence along one side. It abuts on the east side upon the river Don and the South Yorkshire Navigation Canal, which join at this point, and it will, therefore, be understood that the location of the site affords ample facilities for obtaining all the fuel and materials required—either by rail or canal—whilst the proximity of an abundant supply of water for condensing purposes is of importance.

Messrs. John Greenwood, of Mansfield, contracted for the building and civil engineering work, which was commenced in November, 1917, the actual erection of the buildings being started in January, 1918. The boiler house stands on the west side of the site, and takes the form for a double bay with reinforced concrete overhead coal bunkers along the centre. One of the special features of the design of the boiler house is its spacious basement on the ground level which gives ample room for the men to work under healthy conditions, and may be utilised as a store for heavy materials. At each side of the top main concrete beam carrying the bunkers, which are capable of holding 1,200 tons of coal, a special system of ventilation has been introduced with the object of keeping cool the central portion of the boiler house in which the stokers work. The whole of the natural lighting of the boiler house is obtained from the roof.

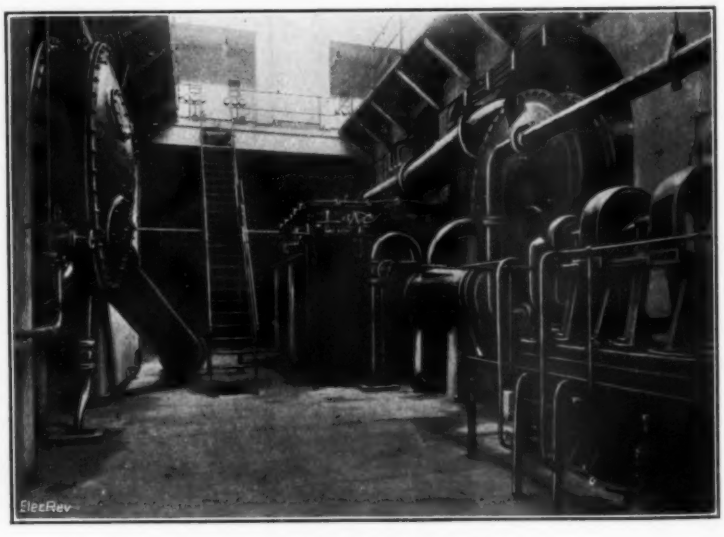


Fig. 4.—Condensers and Transformers.

There are approximately 12,000 tons of reinforced concrete in the main buildings; the use of this material was rendered necessary by the great shortage of steel that was experienced when the work was commenced, and the building of structures of this character being necessarily a slower process than the erection of standard

steelwork, combined with the shortage of labour, considerably delayed the completion of the building.

At the moment all the fuel used is transported by means of the railways, and the sidings originally laid down by the Sewage Disposal Department are employed

Fig. 5.—Main Switchboard.

to deliver it—at present. Two sets of rails are laid at right angles to the existing sidings and 12-ft. turntables are located at the junction of each set of rails with the sidings; electrically-driven Clarke, Chapman capstans are also provided by means of which the loaded wagons are hauled on the sidings. As will be seen from fig. 10, two coal tipplers are installed, one for each pair of rails, and each is capable of dealing with a fully loaded 10-ton wagon. They are of the usual circular revolving type, and each is fitted with a 2-h.p. motor for driving the screw clamping gear which retains the wagon in position while the tippler revolves. The revolving gear is driven by an 8-h.p. motor, and the coal is emptied into a pit from which it is raised by means of two bucket elevators —one for each tippler —to the overhead conveyor. Each elevator is capable of raising 40 tons of coal per hour, and is driven by a 15-h.p. motor. Upon reaching the head gear at the top of the elevator the coal is deposited on a conveyor that runs over the tops of the bunkers and extends the whole length of the boiler house. The conveyor is of the push-plate pattern, is capable of transporting 60 tons of coal per hour, and is driven through speed-reducing gear by a 15-h.p. motor. Suitable apertures in the base plate of the conveyor are provided with sliding doors so as to allow of the coal being deposited into the bunkers at any particular point required. From the overhead bunkers the coal is delivered by means of steel chutes, which are fitted with mixing vanes, into the stoker hoppers, thus automatically feeding the fuel to the boiler furnaces. The contractors for all the coal-handling plant, together with the railway sidings, were Messrs. R. White & Sons, of Widnes.

An interior view of the boiler house is presented by fig. 7; the firing floor is 12 ft. above the basement, and is supported by 180 reinforced concrete stanchions. The number of boilers installed is 14, but only six of them are in use at present; each is capable of evaporating 30,000 lb. of steam per hour from feed water at a temperature of 212 deg. F. to a pressure of 190 lb. per sq. in. Eleven of the boilers are of the 5-drum Stirling type, each of which contains 620 tubes with an outside diameter of 3.25 in., and has a heating surface of 8,282 sq. ft. and a grate area of 196 sq. ft. The boiler mountings and fittings were supplied by Messrs. Clarke, Chapman & Co., of Gateshead, and a superheater is fitted to each boiler comprising 96 tubes, of an outside diameter of 1.5 in., having a heating surface of 1,120 sq. ft., and capable of imparting a superheat of 200 deg. F. to all the steam generated. The three remaining boilers are of the Woodeson pattern, and each has 8,800 sq. ft. of heating surface, 196 sq. ft. of grate area, and contains 894 tubes, 2.5 in. outside diameter. They are also provided with Clarke-Chapman superheaters similar to those mentioned above. The total weight of each boiler when filled with water is 91 tons. The whole of the boiler mountings are of the Hopkinson type; a regulator is fitted to each boiler so as to ensure a constant feed of water into it and to maintain the water at practically the same standard level in the drums during the whole period that the boiler is in service.

A separate Green economiser is installed in the discharge flue of each boiler; it consists of 320 tubes 11 ft. 6 in. in length, and is fitted with the usual scrapers and reversing gear driven by 3-h.p. motors. The quantity of water supplied to each boiler is regis-

Fig. 6.—Main Switchroom.

tered by a Venturi meter, and by this means the actual evaporation of each boiler can be separately ascertained.

The boiler feed pump house is situated on the firing floor level of the boiler house; it is divided into two sections, the first of which contains three six-stage cen-

trifugal pumps supplied by the British Electric Plant Co., of Alloa (fig. 11). Each pump will deliver 20,000 gallons of water per hour against a head of 555 ft., and is direct driven at a speed of 1,440 r.p.m. by a 100-h.p. motor. The second section contains three steam-driven direct-acting Weir cylinder pumps, each capable of pumping 17,000 gallons of water per hour against the working boiler pressure of 190 lb. per sq. in. The

Fig. 7.—Boiler Room.

water supply is derived from a main tank that forms the roof of the pump house; it is passed through two Lea recorders and thence direct to the pump suctions. By-pass pipes are also provided so that water can be drawn direct from the main tank in the event of its becoming necessary to take the recorders out of service. All the pumps discharge direct to the boiler feed mains. A special 5-cell centrifugal pump that is driven by a 30-h.p. motor is included in the pump house to provide the water that is required for boiler tube cleaning purposes, &c.; alternatively, this pump can be used as a

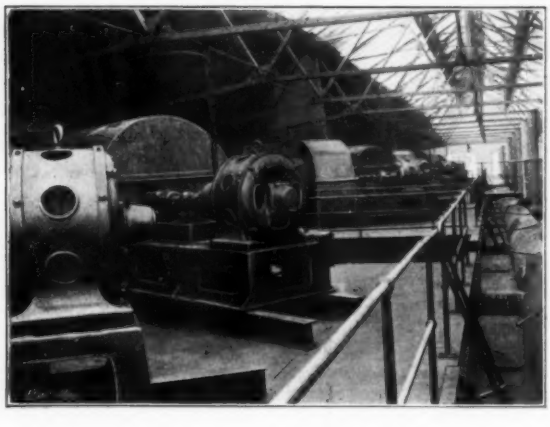


Fig. 8.—Induced-draught Fans.

special fire pump in case of emergency. Between the pumps and the economisers 8-in. diameter steel mains with separate branches are provided in duplicate. A 9-in. town water service main enters the boiler house basement, and two meters are fitted at its junction with the town main, and two others at the point where the main enters the building. From the latter point a 6-in. ring main carries the water to the storage tank above the pump house. From this main branches run over the coal bunkers and are provided with connections for fire hose and also for the domestic supplies of the various mess rooms. A ring main is also provided for the purpose of cleansing the boiler tubes, &c. The main water tank is divided into two sections, either of which can be cleaned out without interfering with the working of the plant; moreover, into it is returned all the water that is drained from the boilers, turbines, and steam pipes, &c., thus helping to heat up the feed water. All the condensed steam from the turbines after being registered by Lea recorders is also pumped back into the main water tank. The pipework in the station was supplied by Messrs. Foster Bros., of Wednesbury, and is supported by slings or on rollers so that the pipes are free to expand in any direction. The solid-drawn 12-in. steel steam mains are arranged to balance the steam between each set of plant, so that under ordinary working conditions the flow of steam in the mains will be negligible.

The turbine room, of which fig. 2 is an interior view, is located on the east side of the boiler house, and is spanned by an overhead electric travelling crane made by Messrs. Herbert Morris, Ltd., of Loughborough. It is suitable for dealing with loads of up to 30 tons, but is

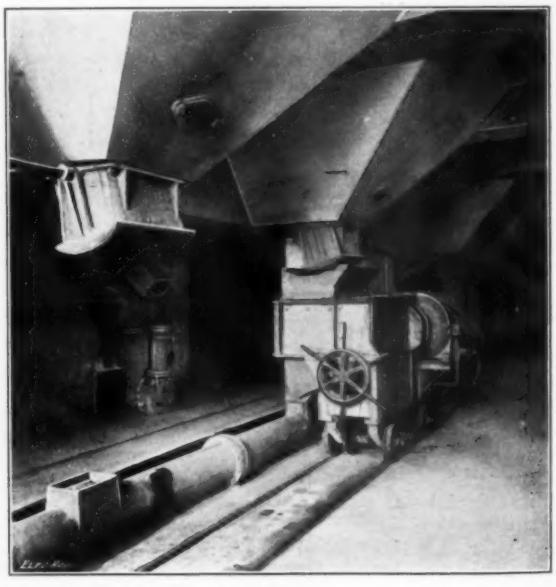


Fig. 9.—Ash Crusher

capable of lifting a dead weight load of 45 tons; it is provided with a 27-h.p. hoisting motor, an 18-h.p. main travel motor, and a 7-h.p. traversing motor. The crane spans 67 ft., travels about 140 ft., and is fitted with a safety device to prevent over-winding; it is controlled from a cab that is slung beneath the main crane girders.

(To be concluded.)

LIGHTING AND POWER NOTES.

(Continued from page 604.)

Lancaster.—Plant Purchase Recommended.—The Electricity Committee recommends that the plant of the Caton Engineering Co. be bought from the Disposal and Liquidation Board for £6,000. It is estimated that it will cost £2,000 to remove it to the power station, where the plant is inadequate to meet the present needs of the town.

Maidstone.—Year's Working.—The accounts of the Corporation's Electricity Department show a loss for the year ended March 31st last of £526.

Manchester.—Loan Sanctioned.—The Electricity Commissioners have sanctioned the borrowing of £50,000 for mains extensions.

Markinch (Fife).—Water Power Scheme.—The Balgonie Colliery Co. is to utilise the water of the river Leven to generate electricity by water turbines.

Navan.—Electricity Supply.—The Urban Council has finally decided to take a public electric lighting supply at 1s. per unit from Messrs. Spicer, local merchants.

Newport.—Cable in River Bed.—The laying of a submarine cable linking the western side of the river Usk with the power station on the eastern side, thereby obviating a long length of cable through the streets of the town, has been completed. The new cables, which are laid in a trench eight feet below the river bed, are part of a scheme of extension on which a capital outlay of £200,000 is contemplated, one of the chief objects being to supply energy to the large new ironworks of Messrs. Whitehead, of Tredegar, which is now under process of completion. A long term contract has been entered into with Messrs. Whitehead, under which the firm will pay the Corporation a minimum of £8,000 and a maximum of £20,000 per annum.

New Zealand.—Auckland.—An agreement has been arrived at between the City Council and the otuside local bodies with regard to the formation of a single electric power board for the Auckland metropolitan area. The Council's electricity undertaking will be taken over by the Board at a price to be fixed later. The capital expenditure on the electricity works to June 30th last amounts to £506,749.—*Reuter's Trade Service* (Melbourne).

Ripon.—Electricity Supply.—The Town Council has decided to ascertain from the War Disposal Board the purchase price of the electricity plant at the North Camp, and what facilities could be afforded to the Corporation in connection with it.

South Africa.—Proposed Orange River Development.—*The S.A. Mining & Engineering Journal* states that in his last annual report, the Inspector of Machinery for the Kimberley district speaks of the possibility of harnessing the power of the Orange River to assist in the development of the iron fields near Postmasburg. These iron fields are devoid of coal for their economical working, and the Aughrabie and King George Falls are about 160 miles away. The falls mentioned are 400 ft. in height, and it is estimated that a power of from 8 to 10 thousand h.p. is available. The Inspector considers that a part of the power might be utilised in the electrification of the De Aar-Windhoek railway and any later branches.

Mossel Bay (Cape Province).—A contract has been entered into between the South African Milling Co. at Beaufort and the Municipality for the supply to the company of all its power requirements from the Municipal Power Station. The contract provides for a minimum consumption of 100,000 units per annum.

Johannesburg.—Owing to the inability of the Town Council to maintain adequate supplies of electricity to cope with the growth of the town and its industries, a demand has arisen that the town should obtain supplementary supplies from the Victoria Falls Power Co. The Labour Party in the Town Council is, however, opposing this demand, as it is considered that it would lose a powerful weapon in the event of an industrial dispute, were the power station to be closed down.

The dispute has been advanced a further stage by a recommendation by the Tramway and Lighting Committee to the Town Council that the Town Clerk be instructed to obtain full particulars of the terms on which the V.F.P. would give auxiliary supply during the period required for the improvement of the municipal supply. This represents a considerable advance, as the tendency on the Labour side of the Council has been apparently to fight against every suggestion of taking current from the V.F.P.—*Cape Argus.*

Spenborough.—Year's Working.—At the District Council meeting last week it was reported that the electricity undertaking had made a profit of £2,285 during the past financial year.

Swindon.—Reduced Charges.—The Town Council has reduced the price of electricity for lighting from 8d. to 7d. per unit, for power from 4d. to 3½d., and for heating and cooking from 2d. to 1½d.

Loan Sanctioned.—The Corporation has received sanction to borrow £42,500 for electricity purposes.

Welshpool.—Electricity Supply.—The Town Council has appointed a committee to investigate the possibilities of a municipal electricity undertaking.

TRAMWAY AND RAILWAY NOTES.

Blackburn.—Tramway Extensions.—The town clerk has been instructed to take steps to include in the Bill being promoted in Parliament powers to extend the tramway system from Cherry Tree to Feniscowles, Billinge End to the borough boundary, and from Wilpshire to Langho.

Brighton.—Loan Sanctioned.—The Electricity Commissioners have given sanction to the borrowing of £20,000, for 15 years, for the reconstruction of certain sections of the tramways.

Continental.—Belgium.—Brussels tramwaymen have threatened to strike unless the company takes back six painters whom it has discharged because it had no more work for them to do.—*The Times.*

Norway.—The Commercial Secretary to H.M. Legation at Christiania states that the Norwegian Storting has granted a concession to A/S Akersbanerne for the construction of an electric railway from the centre of Christiania to Ostensjo, a distance of about 8 km. The work on this line will probably be commenced simultaneously with the construction of the Majorsteun-Sognsvandet Railway, a concession for which was granted recently.—*The Board of Trade Journal.*

Darlington.—Renewal of Track Adjourned.—The Electricity and Light Railways Committee has adjourned consideration of the question of relaying the tramway track in view of the capital outlay which would be involved.

Edinburgh.—New Trucks.—The Tramway Department recommends the ordering of 51 single trucks suitable for the new electric car system. The trucks are to cost £250 each, and with equipment the sum involved is £70,000.

India.—Calcutta Strike.—Owing to a strike of the employés, the Calcutta tramway services are suspended.

Lancashire Railway Electrification.—The plans for the electrification of the Manchester-Oldham, Lytham-Blackpool, and Blackpool-Fleetwood Railways are now complete, and will be carried into effect at the first favourable opportunity.

London.—Proposed "Underground" Extensions.—Further details regarding the ambitious scheme of the London "Underground" Companies were made public last week by Lord Ashfield. The extensions would entail an expenditure of £6,000,000, apportioned approximately as follows:—Reconstruction of the City & South London Railway, with an extension to link up that railway with the London Electric Railway at Camden Town, £4,100,000; extension of the Hampstead line from Golder's Green to Edgware, with intermediate stations at Woodstock, Hendon, Colindeep, and Burnt Ash, £1,200,000; connecting loop between the Central London Railway and the London & South-Western Railway at Shepherd's Bush, enabling the former line to be projected to Kew and Richmond, £700,000.

It is estimated that employment would be given to 20,000 men for at least two years, and the Government is asked to guarantee securities and interest to lower the rate at which money will be obtained in the City. No actual financial assistance is required from the State.

Hammersmith.—The Law and Parliamentary Committee recommends that representations should be made to the Ministry of Transport that the fares on the London United Tramways should be reduced.—*The Times.*

Proposed L.C.C. "Tube."—At the meeting of the London County Council on November 1st, Mr. A. Emil Davies moved: "That in view of the Government scheme for guaranteeing capital to enable works of public utility to be put in hand that will lead to extensive employment, the Council make application to Parliament for the necessary executive powers with a view to applying under such scheme for the sum of five million pounds in order to carry out the construction of tube railways within the country, and especially such as will link up South London with other portions of the Metropolis."

Mr. Davies urged the necessity of greater transport facilities in South London, which was badly served in this respect. After some discussion the motion was defeated by 61 votes to 37.

Manchester.—Loan Sanctioned.—The Tramways Committee has received sanction to borrow £56,000 for the reconstruction of the tramway in Ashton Road, &c.

Tramway Extensions.—The Corporation has commenced laying a double track of tramway lines between Denton and Hyde, a distance of two miles. When the work is completed there will be a through service between Manchester and Hyde.

New Zealand.—Auckland.—The City Council and outside local bodies have come to an agreement, whereby a single electric power board has been formed to take over, among other interests, the tramway service. The tramway assets to June 30th last total £247,041.

Scarborough.—Tramways Purchase Decision.—The Town Council, after careful consideration, has decided that the proposal to take over the undertaking of the Electric Tramways Co. cannot be entertained.

S. E. & C. Railway.—PROJECTED ELECTRIFICATION.—According to *Modern Transport*, the management of the South-Eastern and Chatham Railway has drawn up a comprehensive scheme for the electrification of the company's suburban lines, to be taken in hand as soon as conditions permit. The plans embrace the whole of the lines within a radius of 30 miles of Charing Cross, and for the purpose of electrifying in the first place lines having the heaviest traffic, the lines have been put into two groups. Section A has a route mileage of 94 and a single line mileage of 210, and includes the inner suburban lines. Section B covers 140 route miles, representing 438 miles of single track, and consists principally of extensions of the lines in Section A. The equipment of the running lines will be of the direct-current conductor-rail type. The rolling stock for suburban services will be of the motor car type with "multiple-unit" control, which, to ensure the greatest flexibility of service, will be permanently coupled up in units of three coaches, a unit consisting of two motor coaches each equipped with two 200-h.p. motors and one trailer coach. This arrangement will enable the committee to provide trains of three, six, or nine coaches, accommodating 256, 512, and 768 passengers respectively, in accordance with traffic demands.

Stoke-on-Trent.—TRAMWAY PURCHASE.—At a recent meeting of the Council a letter was read from the Potteries Electric Traction Co. asking the Council to defer its right to purchase the tramways until the year 1952. This the Council refused to do.

TELEGRAPH AND TELEPHONE NOTES.

Finland.—WIRELESS TELEPHONY.—The directors of Södra Finlands Interurbana Telefon A.B., of Helsingfors, have made application to the Finnish Ministry for Communications for the grant of a concession for the establishment of a system of radio-telegraphy between Finland and Sweden for general public use. According to the company's statement, it is proposed to form a separate company, in which the Finnish State would have the opportunity of being represented, for the execution of the scheme. A radio station would be erected in the vicinity of Helsingfors and would also be provided with apparatus for effecting a connection with the station of the Interurban Telephone Co. in Helsingfors, and the latter station would serve as the intermediary for all the telephone messages. The concession is asked for a period of 15 years with the exclusive right of establishing and maintaining telephone communication with Sweden, although it is suggested that the State, if deemed desirable, should be empowered to take over the undertaking at an earlier time or at the end of ten years. Should the State refuse to prolong the concession, the State would be placed under the obligation to purchase the company's property. If a concession can be obtained by the Interurban Telephone Co. in Finland and by the competent company (Radio) in Sweden, it is said that these countries will be the only ones which will possess, after England and Holland, a system of wireless telephony. The question has not yet been investigated by the telegraph authorities in Sweden, although it is said that cable connection is preferable to wireless telephony.

Italy.—SUBMARINE CABLE DEVELOPMENTS.—Signor Giuffrida, Italian Minister of Posts and Telegraphs, speaking at the final meeting on October 21st of an electrical congress held at Catania, mentioned that a committee was engaged on the investigation of a scheme for the transmission of energy across the Straits of Messina to Sicily. As to his own particular department the Minister is reported to have stated that new telegraph cables would be laid between the Continent and Sicily, between Ravenna and Trieste and Genoa and Nice, and new lines of direct communication with the principal European centres were being examined. In addition, an agreement had recently been signed for the establishment of a direct submarine cable to Spain and to South America, and it was hoped to have another direct cable to the United States. Among the developments proposed in the telephone service, the Minister stated that the five networks in Turin, Genoa, Milan, Rome, and Naples were to be transformed to the automatic system, while Pupin coils would be used in connection with telephony from one end of Italy to the other.

STORMS.—Bad storms raged last week in the south of Italy and both telephonic and telegraphic communication was severed, says *The Times*.

Turkestan.—TELEGRAMS IN CENTRAL ASIAN TONGUES.—The Postal Department of Turkestan has prepared a telegraphic Morse alphabet for telegrams in the Kirkgis and Usbek languages. The results on trial were quite satisfactory. Telegrams in the local languages are already being exchanged between Old and New Tashkent.

Uruguay.—NEW TRANSATLANTIC CABLE.—The work of uniting Uruguay with Italy by cable will shortly be begun. This line will connect Rome, Spain, and Brazil with Monte Video, says the *Financial News*.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared.)*

OPEN.

Australia.—MELBOURNE.—City Council. February 20th. One 2,000-kW rotary converter with transformer, also 6,600-V, 50-cycle, 3-phase switchgear.—*Reuter's Trade Service* (Melbourne).

NEWCASTLE (N.S.W.).—December 22nd. City Council. One 25-kW motor-generator set. Electrical engineer and manager, Watt Street, Newcastle (N.S.W.).

SYDNEY.—April 24th, 1922. City Council. One 10,000-kW turbo-alternator and two 2,000-kW rotary converters.—*Reuter's Trade Service* (Melbourne).

Argentina.—BUENOS AIRES.—January 19th, 1922. Board of Sanitary Works. Plant and accessories for a new generating station, comprising three four-cycle Diesel engines of 375 h.p., and three 3-phase alternators each of 250 kW, 2,200 V, 50 cycle.*

Aylesbury.—November 11th. Town Council. Electric motors and pumps. (October 21st.)

Dublin.—November 16th. G.N.R. Co. of Ireland. Three months' supply of stores including electrical fittings, lamps, cable, wire, &c. (See this issue.)

London.—L.C.C.—November 28th. Water-tube boilers, superheaters and economisers, &c. (October 21st.)

Metropolitan Asylums Board. November 23rd. Installation of electric lighting cables throughout the training ship *Exmouth*, off Grays, Essex. (See this issue.)

Portsmouth.—November 18th. Corporation. Four centrifugal pumps, direct coupled to 3-phase, a.c. motors, sludge pump and motor, and various small motors, switchboard cables, lighting, and other apparatus. (October 21st.)

Sheffield.—November 26th. Health Committee. Plant and machinery for refuse disposal works, including cranes, switchboard, pumps, &c., steam-driven electrical plant and condensers, motors, and starters, &c. (October 28th.)

South Africa.—DURBAN.—Municipal Council. 250 s.p., or 125 d.p. ironclad fuses, 25 amperes, 200 volts; 500 combined double-pole enclosed switches and fuses, 35 amperes, 200 volts, suitable for house service use; 144 single-pole switch fuses, unmounted, 100 amperes, 200 volts; 50 single-pole switch fuses of the "Brush" or other similar type, 50 amperes, 2,750 volts, suitable for sub-station use. One 3-phase transformer, 25 kVA capacity, 50 cycles.*

JOHANNESBURG.—November 24th. 15,000 traction lamps, 110 V, 20 watt, metallic filament; 24 750-A s.p. knife switches; 36 400-A ditto; 36 200 amp. ditto. (Contract 828.) Delivery of the lamps to be made as and when required, commencing early in March, 1922.*

Warrington.—November 15th. Electricity and Tramways Committee. Motors and transformers. (October 21st.)

Whitehaven.—December 1st. Electricity Supply Department. Two water-tube boilers with superheaters, economisers, pipework, &c. (See this issue.)

* A copy of the specification, &c., can be consulted at the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

CLOSED.

Australia.—MELBOURNE.—Morwell electric supply and briquetting.

The Victorian Electricity Commissioners have accepted the offer of Zeitz and Co., of Halle, Germany, to supply a briquetting plant at a cost of £110,000. The Commissioners state that no knowledge of the successful briquetting of brown coal without the use of a binder exists outside of Germany, and that no other country is able to provide certain specialised machinery of guaranteed efficiency for such a purpose. The plant to be installed will be capable of producing 96,000 tons per annum at an estimated cost of £350,000. The plant will later be expanded to a commercial factory producing 300,000 tons per annum, which is estimated to cost £750,000. In addition to the briquetting plant to be supplied by Zeitz & Co., £264,000 will be expended in buildings, boilers, conveyors, electrical plant, and other appliances, a large portion of which will be obtained in England.

Coal-handling plant for Newport "B" station, £17,850.—Fraser & Chalmers, Ltd.—*Tenders.*

SYDNEY.—Electric Supply Committee. Recommended:—

A.c. meters.—Metropolitan-Vickers Co., Ltd., for type "N."

Meters, &c.—Noyes Bros. (Sydney), Ltd., for Ferranti type "C" meters. Each firm to supply 6,000 5-amp., 2,000 10-amp., 600 20-amp., 50 50-amp., spare parts, &c., total £17,720.

D.c. meters.—Noyes Bros. (Sydney), Ltd., Ferranti type meters, £6,307.—*Tenders.*

Bury.—Town Council. Accepted. In connection with extensions at Chamber Hall power station, the Town Council has sealed contracts with the following firms:—

Switchboard floors.—Maclean & Co.
Extension gallery.—J. Webb & Sons, Ltd.
Switchboard.—Ferguson, Pailin & Co.
Electric capstan.—Clarke, Chapman & Co.
Coal weighing machines.—W. & T. Avery, Ltd.
Structural steelwork.—Holden & Porter.

G.P.O.—Messrs. Johnson & Phillips, Ltd., have just received from the Post Office Engineering Department a contract to manufacture, supply and lay a trunk telephone cable between Glasgow and Edinburgh. The order comprises 46 miles of 204-pair cable.

Newcastle-on-Tyne.—Corporation Electricity and Transport Committee. Recommended:—

1,500 tons rails for the permanent way.—Bolckow, Vaughan & Co., Stockton-on-Tees, £12 10s. per ton. This is stated to be slightly in advance of the lowest foreign tender.

New Zealand.—WELLINGTON.—Accepted:—

6,000 66,000-V Canadian insulators, in connection with the Lake Coleridge hydro-electric power scheme, £11,501.—Lawrence & Hansen.—*Tenders.*

Romford.—Board of Guardians. Accepted:—

A 25-line telephone for the medical officer's residence.—Private Telephone and Electric Co., Ltd.

South Shields.—Corporation. Accepted for the Electricity Department:—

E.h.t. feeders and pilot cables, £1,417.—British Insulated & Helsby Cables, Ltd.
E.h.t. sub-feeders, at £577 12s., and underground distributing mains, house service switch control mains and services for public street lamps, for the sum of £1,412.—British Insulated & Helsby Cables, Ltd.
E.h.t. switchgear, £1,387.—Reyrolle & Co.
Three car bodies, at £400 per car, including teak frames, for the Tramway Department.—English Electric Co.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, November 4th. At Caxton Hall, S.W. At 8 p.m. Lecture on "The Timber Trees of Commerce," by Mr. T. H. Ivey.
Friday, November 11th. Question and general discussion evening.

Society of Engineers (Incorp.).—Monday, November 7th. At Burlington House, Piccadilly, W. At 5.30 p.m. Paper on "Extraction Turbines," by Mr. C. H. Naylor.

Institution of Electrical Engineers.—Informal meeting. Monday, November 7th. At the Institution, Victoria Embankment. At 7 p.m. Discussion on "How Best to Speed Up Electrical Progress," to be opened by the President of the Institution (Mr. J. S. Highfield).
(Liverpool Sub-Centre).—Monday, November 7th. At the University, Liverpool. At 7 p.m. Chairman's (Mr. G. H. Nisbett) address.
(Western Centre).—Monday, November 7th. At the South Wales Institute of Engineers, Cardiff. Chairman's (Mr. A. C. MacWhirter) address.
(Scottish Centre).—Tuesday, November 8th. At 207, Bath Street, Glasgow. At 7.30 p.m. Chairman's (Mr. E. T. Goslin) address.
(Wireless Section).—Wednesday, November 9th. At the Institution. At 6 p.m. Chairman's (Dr. G. W. O. Howe) address.
(London Students' Section).—Friday, November 11th. At the Institution, Victoria Embankment, W.C. At 7 p.m. Opening address, "The Future of Railway Electrification," by Sir Philip Dawson, M.P.
(Scottish Centre, Students' Section).—Friday, November 11th. At the Royal Technical College, Glasgow. At 7.30 p.m. Address by the chairman (Mr. A. Lindsay).
(Irish Centre, Dublin).—Friday, November 11th. At the Royal College of Science, Dublin. At 8 p.m. Discussion on the Report of the Fuel Research Board on the winning, preparation, and use of peat in Ireland, and on the Report of the Sub-committee on the Water-power Resources of Ireland.
(North-Midland Centre).—Tuesday, November 15th. At the Hotel Metropole, Leeds. At 7 p.m. Chairman's (Mr. W. E. Burnand) address and smoking concert.
(North-Western Centre).—Tuesday, November 15th. At the Engineers' Club, Manchester. At 7 p.m. Chairman's (Mr. W. Walker) address.

Institute of Marine Engineers.—Tuesday, November 8th. At the Institute. At 6.30 p.m. Paper on "Liquid Fuel and its Application for Steam Generation," by Mr. J. H. Anderson.

Electro-Harmonic Society.—Friday, November 11th. At the Grand Hall, Cannon Street Hotel. At 8 p.m. Ladies' night.

Exhibition of Housecraft.—(Under the direction of Miss Gwynne Howell). At 17, Harrington Gardens, Gloucester Road, S.W. From November 8th to November 11th. 11 a.m. to 5 p.m.

Motor Exhibition.—November 4th to 12th. At the White City and Olympia, London.

Northampton Engineering College Engineering Society.—Wednesday, November 9th. At the Northampton Institute, Clerkenwell, E.C. At 5.30 p.m. Paper on "Airships," by Mr. H. C. Brown.

Nottingham Society of Engineers.—Wednesday, November 9th. At the Welbeck Hotel. At 8 p.m. Paper on "The Training of Apprentices," by Prof. H. Schofield.

Royal Society of Arts.—Wednesday, November 9th. At John Street, Adelphi. At 8 p.m. Paper on "The Work of the Industrial Fatigue Research Board and its Applications to Industry," by Mr. D. R. Wilson.

Chelmsford Engineering Society.—Thursday, November 10th. At the East Anglian Institute of Agriculture. At 7 p.m. Students' meeting.

Edinburgh Electrical Society.—Friday, November 11th. At the Philosophical Institute. At 8 p.m. Paper on "Some Particulars Regarding C.T.S. Cable," by Mr. D. Landale Few.

Association of Engineers-in-Charge.—Saturday, November 12th. At the Holborn Restaurant. Ladies' night. Dinner and dance.

Birmingham and District Electric Club.—Saturday, November 12th. At the Grand Hotel. At 7 p.m. Paper on "The Gyroscopic Compass," by Mr. H. F. Steventon.

Salford Technical and Engineering Association.—Saturday, November 12th. At the Royal Technical College. At 7 p.m. Members' short papers in competition for Gold Meda, awarded by Mr. W. O. Larmuth.

THE "ELECTRICAL REVIEW" SERVICE DEPARTMENT.

For many years past we have been replying through the post to inquiries sent to us by our readers.

The queries, which have numbered many thousands, have covered almost every conceivable matter which can be connected even remotely with any one of the innumerable fields into which electricity has spread.

Perhaps the most common request is for the name of the manufacturer of a particular piece of apparatus, especially apparatus which is known under a trade name, such as (to give well-known examples) Osram, Simplex, Mazda, &c. In this field alone we may claim to have been the means of putting literally thousands of potential purchasers into touch with the makers of the goods which they require.

Many of our readers are already aware of this service to the electrical industry which we have considered it a privilege to be able to render in the past, but we wish the large number of new readers to know that the same service is equally at their disposal provided the following simple rules are observed:—

1. Address your inquiries to the ELECTRICAL REVIEW, Ltd., Service Department, *and enclose a stamped addressed envelope.*

2. Do not ask for information until you have satisfied yourself that it is not already contained in our advertisement pages.

3. If we are the means of putting you in touch with the firm or firms that you require, do us the favour of mentioning the ELECTRICAL REVIEW.

No charge is made for the service.

NOTES.

Freemasonry.—On Friday last, the annual installation meeting of the Kelvin Lodge, No. 3736, was held at Mark Mason's Hall, when Mr. H. Porter-Cox, the W.M., installed Mr. E. E. Sharp as his successor in the chair. In this instance particular interest attached to the ceremony, inasmuch as Mr. Sharp is already reigning Master of the Electric Lodge, so that he is now actually reigning over the two Masonic Lodges which are most intimately associated with the electrical profession.

Among those who were present at the banquet which followed the ceremony were: Messrs. Percy Still, P.G.D.; Charles F. Quicke, P.G., Supt. of Wks.; F. A. B. Lord, P.A.G., St. B.; John W. Elliott, P. Prov. J.O.D. (Herts.); G. T. Fairbrother, P.M., 2455; W. B. Ross, P.M., 2767; and C. H. Wordingham, Past President Inst.E.E., as well as many other gentlemen intimately associated with the electrical industry.

Fatality.—An inquest was held at Hammersmith recently upon Henry Melhuish, an L.C.C. tramcar driver, who died as the result of a collision between his car and a motor lorry. It was stated that before his death deceased stated that a mist suddenly came before his eyes, and he lost consciousness, and was therefore unable to apply the brakes. A doctor stated that death was due to syncope from heart disease accelerated by the shock received in the collision. A verdict of "Accidental death" was returned.

Appointments Vacant.—Plumber-jointer, for the Southend Corporation Electricity Department; sub-station attendant for the Newport Corporation Electricity and Tramways Department; general assistant (£547), for the Chesterfield Corporation Electricity and Tramway Department. (See our advertisement pages to-day.)

French Transport Conference.—Mr. G. J. Shave, operating manager and chief engineer of the London General Omnibus Co., and Mr. A. V. Mason, deputy general manager and engineer of the London and Suburban Tramway Group, attended a Convention of the Unions des Voies Ferrées d'Interêt Local and des Transports Publics Automobiles de France, held in Paris recently. Papers were real on permanent-way construction, supply of electrical energy, electrolysis, the trolley 'bus, and the economical position of surface transport generally. At the Convention representatives were present from all the important towns in France, Belgium, Italy, Sweden, and Denmark. One of the most important matters arising out of the meetings was the suggestion that the various operating concerns in this country should be officially represented by their associations at these conferences, so that matters of technique and standards could be discussed and settled internationally.

Smoke from Steam Trains.—It is reported that a final warning has been addressed by the Public Control Committee of the London County Council to all companies running steam-driven trains into London, calling attention to the smoke nuisance arising from locomotives, and stating that it is the intention of the Council to take steps to obviate it.—*Morning Post.*

Trade Conditions and Unemployment in the Electrical Industry.—Whilst going to press we have received the following important particulars regarding the work of the Conference of Joint Industrial Councils and other bodies, which was briefly referred to in our last issue:—

The conference having made exhaustive inquiries, addressed a memorandum to Sir Alfred Mond as chairman of the Cabinet Committee upon Unemployment, who received a deputation at the Ministry of Health on Wednesday last. The Minister was supported by Mr. Arthur Neal, M.P., and Sir John Snell, Chairman of the Electricity Commission, and was addressed by Mr. Ll. B. Atkinson, Chairman of the Conference, supported by Mr. Alderman Beaumont and Mr. Kelly.

The Chairman, having pointed out that the deputation, probably for the first time in the history of such deputations, represented the whole industry through its Industrial Councils, thus including the workpeople as well as the employers, and that the memorandum was a unanimous expression of opinion, outlined the subject and dwelt at some length upon the present position of the industry, which was faced with the prospect of progressive unemployment unless certain conditions could be altered immediately. The memorandum dealt with (1) the steps necessary to reinstate permanently activity and employment in the electrical industry, and (2) the steps necessary to relieve temporarily unemployment in the electrical industry.

The Chairman proceeded to emphasise the following propositions:—

First, that unreproductive outlays by the State should be closed down, except those absolutely necessary for security and health.

Secondly, that the electrical industry in particular should be assisted by the removal of uncertainties which were checking its development, (*a*) by defining as early as possible the Government policy with regard to the future control of electricity supply; (*b*) by speeding up adjudication on all schemes already submitted to the Electricity Commissioners; (*c*) by allowing supply undertakings to increase charges to meet the changed economic conditions; (*d*) by action at the earliest possible moment by the Government to clear up the uncertainties under which the railway companies were labouring, as to the effect on their capital accounts of the groupings proposed.

The Chairman next proceeded to outline the steps recommended for the immediate alleviation of unemployment in the electrical industry.

Inquiries had been made to ascertain the schemes of electrical development which had already been prepared and were ready to be put into operation, but which for one reason or another were at present held up. The replies received from the majority of the undertakings communicated with were summarised as follows:—

"There exists a large amount of potential work and additional employment which is being held up on account of (*a*) uncertainty with regard to the future legislation or control in certain districts; (*b*) difficulty in financing extension works which cannot become remunerative until a considerable time has elapsed."

The important suggestion was made that Government assistance should be given towards interest payments and the postponement of sinking funds for a reasonable period; then it would become possible to put in hand extensive and valuable works, ultimately becoming productive, and immediately affording a large amount of employment.

It was also pointed out that there appeared to be a good deal of uncertainty as to the extent to which such undertakings could apply for assistance in the payment of interest under the memorandum recently issued by the Ministry of Health concerning Government contributions towards the payment of interest on capital expended on productive undertakings.

The question of London transport extensions and railway electrification generally was dealt with at great length, attention being drawn by the deputation to the difficulties existing with regard to carrying out schemes of electrification already prepared because of the uncertainty in connection with the precise form which railway grouping might be expected to take.

Mr. Atkinson also drew attention to the large amount of work which might result from a decision to go ahead with telephone extensions, at present held up, and the attention of the Minister was drawn to the difficult question of the purchase of electrical requirements for the use of the Indian Government in competition with foreign manufacturers under the present conditions of foreign exchange. Suggestions were made in this connection in which Sir Alfred Mond expressed himself extremely interested, and which he promised to pursue further.

In replying to the deputation, Sir Alfred Mond expressed his appreciation of the work of the Conference, and his desire to apply practically some of the suggestions made. He stated that the paralysing effect of uncertainty as to the future action of Government relative to the electrical industry was appreciated, and that the Transport Department was dealing with it. He referred similarly to the question of railway grouping. On the point of assistance towards payment of interest on municipal loans, he made it clear that the Ministry of Health's memorandum applied to electrical undertakings. He agreed with the view of the deputation that it was unreasonable to ask commercial undertakings to commence the operation of sinking funds immediately the works were completed and before earnings commenced, and thought that Government action could be taken in this direction.

He stated that the telephone extension proposals had received most careful consideration by the Government, and he anticipated being able to make a useful suggestion in a few days. With regard to the Indian Government purchase, he was sympathetic, and the matter was under discussion.

Mr. A. Neal, M.P., added to what Sir Alfred Mond had stated, that the position of the smaller companies had been intended to be dealt with by a clause in the Electricity (Supply) No. 2 Bill, 1920, but that he would endeavour to see that this difficulty was removed, the principle having been agreed in other cases. He stated that a large number of recommendations of the Electricity Commissioners were ready for placing before Parliament for sanction early next session. He thought the question of uncertainty was exaggerated. The policy had already been laid down; the final legislation necessary to give it effect had not yet been carried through, but as far as he could conceive, no delay would take place in pushing it forward, and then giving executive sanction to the policy already clearly understood.

The deputation tendered thanks to Sir Alfred Mond and his colleagues.

New American Washing Machines.—To the making of washing machines there is no end in the United States, and a recent issue of the *Electrical Review* (Chicago) contained descriptions of a number of new designs embodying points worth noting.

A recent incident in a small electrical exhibition, when a lady came perilously near to being entangled in an exposed running belt of a washing machine, has convinced us of the imperative necessity of enclosing all gears and belts. This may be accomplished fairly well by an ordinary belt guard, but one of the new American washers is entirely closed in by a frame in which thin wood panels are inserted.

Another design possesses two or more containers for linen, &c., all operated by one motor. The driving gears are totally enclosed in a cast-iron casing. One of the other machines described is also gear-driven, and the pinions and connecting rods are safely housed. Machines employing reciprocating motion and those with rotary motion appear to be evenly divided, although in the latter case the motion is reversed at every few revolutions. This has led to considerable ingenuity in the devising of reversing gear, the main object being to eliminate the jar when the change of direction is effected. The use of a rotating "dolly" does not appear to be favoured in the latest designs of washing machines.

Electric Service on the Western Ranch.—Under this title the *Electrical World* draws attention to the immense possibilities of electric service on the farm:— In the Pacific Coast and north-west districts, where electric service lines and motor-driven pumps have created veritable gardens, an area of 40 acres is still rated as a ranch. In the San Joaquin Valley, for instance, where these small ranches abound, the public enjoys a real interpretation of electric service that would be a great asset to other sections as well. In that valley farmers or ranch owners are making advance applications for electric service connections and anxiously await station construction that will make these possible. Forest land now used for cattle raising and grain production, at a value of $150 to $300 per acre, will have a value of from $1,500 to $2,500 as soon as irrigation is made possible. Self-interest there is a powerful influence for electrical development, which is gaining the ear of the public service commissioner and the investor alike. But this same type of self-interest exists in other sections. The San Joaquin Light and Power Co. has simply pointed the way to its application in the development of electric service elsewhere. Only fifteen years ago that company was a struggling concern with just enough generating capacity to take care of the limited needs of a few small communities and with a gross income of $125,000. To-day it serves a great fertile valley and has a return of $4,500,000 annually, built largely upon the good will of the rural public it serves.

I.E.E. Model Conditions of Contract.—The model form of general conditions recommended by the Institution of Electrical Engineers for use in connection with contracts has recently been revised. Copies may be obtained from the Secretary of the Institution, Savoy Place, Victoria Embankment, London, W.C.2, or from the publishers, Messrs. E. and F. N. Spon, Ltd., 57, Haymarket, London, S.W.1. The price per copy is two shillings (post free 2s. 2d.).

Polish Electrical Congress.—A three days electrical congress of Polish electricians, reports *Berlingske Tidende*, was to have been held at Thorn commencing on October 30th. One of the principal subjects down for discussion was the electrification of Poland from the technical and the economic points of view.—*Reuter's Trade Service* (Copenhagen).

INSTITUTION NOTES.

The Institution of Electrical Engineers.—A special general meeting of corporate members and associates of the Institution is to be held on November 17th at 5.45 p.m., for the purpose of considering and, if thought fit, passing resolutions to the following effect:—

1. That the Institution be wound up voluntarily, and that Sir James Devonshire, K.B.E., and P. F. Rowell be appointed liquidators for the purposes of such winding-up.

2. That the property of the Institution remaining after the satisfaction of all its debts and liabilities be transferred to the Institution of Electrical Engineers incorporated by Royal Charter dated August 15th, 1921.

Should the above resolutions be passed by the requisite majority they will be submitted for confirmation as special resolutions to a further special general meeting of corporate members and associates on December 2nd, at 5 p.m.

Ordinary Meetings.—In addition to the Ordinary Meetings mentioned in our last issue, the following are announced: December 1st, paper on "The Cyc-Arc Process of Automatic Electric Welding," by Messrs. L. J. Steele and H. Martin; December 15th, paper on "Induction-Type Synchronous Motors," by Mr. L. H. A. Carr; January 5th, 1922, lecture by Dr. S. P. Smith (with experiments), "Single and Three-phase Commutator Motors with Shunt and Series Characteristics"; January 19th, discussion on "The Utilisation of Waste Heat from Electrical Generating Stations" (joint meeting with the Institution of Heating and Ventilating Engineers).

Scottish Centre.—The first meeting of the session is to be held on November 8th in Glasgow, when Mr. E. T. Goslin, the chairman, will deliver his inaugural address. A smoking concert is to be held on December 17th, and the annual dinner of the Centre has been arranged for February 22nd, 1922.

The annual report shows that at the end of last session the membership was 567, an increase of 44: the average number present at ordinary meetings was 64.

The Students' Section holds its first meeting on November 11th; Mr. Lindsay will deliver his address as chairman.

Institution of Civil Engineers.—On Tuesday last the new president, Mr. W. B. Worthington, was installed in the chair. In the course of his inaugural address he dealt with the origin and aims of the Institution, and deprecated the modern tendency to regard "civil engineering" as a branch of the engineering profession, on a par with the mechanical, electrical and other branches, whereas it embraced all branches.

Association of Mining Electrical Engineers.—At the inaugural meeting of the session of the North of England branch of the Association that was held at Newcastle-on-Tyne on October 29th, Lieut.-Col. F. R. Simpson, the branch president, delivered an address, in the course of which he said that, with regard to the application of electricity to underground hauling, the aim of mining engineers was to reduce the number of horses employed. So far, no system had been evolved by which the haulage over the first 180 yards from the face could be performed except by hand or by means of a pony, and the cost per ton mile over that short distance was notoriously high—at present it was not less than 6s. per ton mile. The introduction of mechanical conveyors to long-wall faces had to a great extent relieved that difficulty, and by concentration enabled auxiliary haulage to be applied. There were, however, many collieries wherein for various reasons the coal getters worked singly, or in pairs, and the small quantities obtained from the large number of places rendered the application of machinery impossible. For those reasons the abolition of horses was not possible, but endeavours should be made to eliminate horse haulage except in the first 180 yards from the working face. At a colliery in which the speaker was interested, experiments were being made with a storage battery locomotive, and satisfactory results had been obtained. The chief particulars were: Weight, including batteries, 35 cwt.; dimensions, 6 ft. long by 4 ft. high, by 3 ft. wide; speed with load, 5 m.p.h.; batteries, two sets each consisting of 24 cells; voltage, 44; b.h.p., 2, 300 per cent. overload; motor revs., from 1,400 to 1,600; gearing, 17—1. The work done was 45 sets of 12 tubs per day. The full set weighed 7¼ tons, and the empties 2 tons 12 cwt.; the distance run per day was 20 miles. It was considered that the locomotive was doing the work of three ponies. The heaviest gradient was 1 in 36. The road was dry; the rails weighed 22 lb. per yard with fishplates. It had been found that if the gradient were more than 1 in 25 with a load of two tons 12 cwt., the weight of the locomotive was not sufficient to avoid slipping of the driving wheels. In his opinion, that method of hauling required the serious consideration of mining electrical engineers who, with their knowledge of underground conditions, should be well fitted to evolve a thoroughly efficient locomotive at a reasonable first cost.

Statements had been made during the last few years as to the want of enterprise in the equipment of British coal mines, but he did not think that on investigation they could be substantiated. In that respect he found that at a colliery capable of raising one million tons of coal per year, the electrical plant installed amounted to 2,969 h.p., and within a few months would reach 3,582 h.p. That plant included pumping, ventilating, winding, hauling, air compressing, coal-cutting and coal-conveying. That was only one place, but he had reason to believe that it was typical of collieries in the Northern coalfield.

Junior Institution of Engineers.—The following meetings have been arranged to take place at the Birmingham Chamber of Commerce, New Street, at 7 p.m., under the direction of the Midland Section Council of the Institution:—

November 18th, 1921.—Prof. K. Neville Moss, O.B.E., M.Sc., will lecture on "Coal Mining in Great Britain."

December 6th, 1921.—Mr. R. B. Askquith Ellis, A.M.I.Mech.E., will deliver his presidential address.

January 10th, 1922.—Mr. J. Fearn, A.M.I.Mech.E., and Capt. F. W. Spencer will read a paper on "Drop Forgings."

The Institute of Cost and Works Accountants.—The next preliminary, intermediate and final examinations will be held on December 5th, 6th, and 7th, at London, Manchester, Birmingham, Sheffield, Glasgow and Bristol. (Other centres will be arranged should sufficient demand arise.) Forms of application can be obtained from the Secretary, 38, Grosvenor Gardens, S.W.1.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

At a special meeting of the Glasgow University Court, as has been announced already in the Electrical Review, Dr. G. W. O. Howe was appointed professor to the newly-founded James Watt Chair of Electrical Engineering in the University. Mr. Howe, who is at present head of the Department of Electrical Standards and Measurements at the National Physical Laboratory, Teddington, took the degrees of B.Sc. and M.Sc. at Armstrong College, Newcastle-on-Tyne, and received the degree of D.Sc. from Durham University. When at

Photo by [*Whitlock, Birmingham.*

Professor G. W. O. Howe.

Adelaide with the British Association he was made an honorary D.Sc. of Adelaide University, and in 1900 he was senior Whitworth Scholar. Dr. Howe served a five years' apprenticeship with Messrs. Siemens Bros. at Woolwich, two years in the cable design department of that firm, two years in the Berlin Works of the Siemens-Schuckert Co., designing and testing electrical machinery, and one year in the dynamo design department at the Woolwich works. His teaching experience consists of two years head of the electrical engineering department at Hull Municipal Technical College, and 16 years at the City and Guilds (Engineering) College (Imperial College of Science and Technology), South Kensing-

ton, from 1905 to 1909 as lecturer, and from 1909 till June, 1921, as assistant professor of Electrical Engineering. Dr. Howe is a member of the Institution of Electrical Engineers and Chairman of the Wireless Section, in which capacity he will deliver an address to the Section on November 9th. He is also a Fellow of the Physical Society, and has been a member of various technical boards and advisory committees, besides being the author of numerous papers contributed to the Royal Society, the Institution of Electrical Engineers, the Physical Society, &c. Since 1914 he has been recorder of the Engineering Section of the British Association.

Last Friday evening the staff and employés of the Bolton Corporation Electricity Department met for a social evening at the invitation of the borough electrical engineer, Mr. W. J. H. WOOD. Advantage was taken of the occasion to present Mr. Wood with a mahogany pedestal writing table and chair, and a solid silver tray, as tokens of esteem on the occasion of his marriage. Mr. Edward Jones, secretary, who presided over a very representative gathering, spoke of the excellent feeling which existed between Mr. Wood and the staff and employés, and referred to his own 20 years' association with him. Messrs. B. S. Hornby, G. R. Yates, A. E. Kirkman and J. Boothroyd supported, and Mr. F. L. Garstang (station engineer) asked Mr. Wood's acceptance of the presents from the whole of the members of the department. The recipient very feelingly responded. A miscellaneous musical programme was contributed to by members of the department. The wedding took place at St. Martin's, London, on Wednesday, November 2nd, the bride being Miss Marjorie Richardson, of Bolton.

Mr. WALTER LEWIS, who has resigned the position of goods superintendent on the Great Western Railway at Cardiff on reaching the retiring age, has joined the board of Booth and Bamford, Ltd., electrical engineers, Cardiff.

Major R. W. KLITZ, A.M.I.E.E., late I.O.M. first-class, R.A.O.C., formerly chief assistant electrical engineer with the Wimbledon Corporation, has recently been gazetted out of the Army on completion of service, and is open to take a partnership in an electrical concern.

Mr. E. MOXON, borough electrical engineer for South Shields for the last two years, has resigned his appointment, he having been appointed to a similar position at Southport. The committee, in agreeing to release Mr. Moxon within six weeks from the date of his resignation, are parting from him with regret, and have placed on the records a reference to the valuable services rendered by him to the Corporation during his two years of office. During that period important extensions to the station and plant have been carried out.

The Franklin Institute, acting through its Committee on Science and the Arts, awarded, on October 19th, its Elliott Cresson Gold Medal to Dr. Byron E. Eldred, of New York, for his low expansion leading-in wire for incandescent electric lamps; it also awarded to Mr. Alfred O. Tate, of Cranston, Rhode Island, its Howard N. Potts Gold Medal for his electrolytic process of waterproofing textile fabrics.

Mr. OSCAR BERRY, F.C.A., C.C., has been elected deputy-chairman of the Commercial Education Committee of the London Chamber of Commerce. He is also to serve on the Governing Body of the City of London College, as a representative of the London Chamber.

Mr. G. W. MATTHEW, who for the last seven years has been in charge of the Supply Department of Messrs. Metropolitan-Vickers, Ltd., South Wales Branch, has now joined the board of Messrs. Cesco, Ltd., formerly the Commercial Electric Supplies Co., and has accepted the position of joint managing director with Mr. A. H. Smith, who was previously with the General Electric Co., Ltd., Cardiff branch.

Mr. D. G. DAVIS, B.Sc., of Redditch, has been appointed resident power station engineer under the Clyde Valley Electrical Power Co.

We congratulate Mr. W. VALENTINE BALL, son of the late Sir Robert Ball, upon his appointment to be a Master of the Supreme Court, King's Bench Division.

Mr. H. W. DAUNCEY, manager of the Cantie Switch Co., Ltd., is to be relieved of his duties on the 14th inst., owing to a breakdown in his health. For the present letters for him should be sent to him at his home address: "Bacton," Priory Avenue, Sudbury, Harrow.

Obituary.—LIEUT.-COL. P. J. PREECE.—We regret to read in *The Times* that Lieut.-Col. Percy John Preece, T.D., late 2/8th London Regiment (Post Office Rifles), of Cefn Rhos, Carnarvon, third son of the late Sir William Preece, K.C.B., F.R.S., passed away on October 29th at Wimbledon.

MR. G. LEDGER.—The death took place at Thorpe Bay, Essex, on October 27th, at the age of 83 years, of Mr. George Ledger, who was for 52 years on the staff of the Telegraph Construction & Maintenance Co.

PROF. F. E. ARMSTRONG.—We regret to record the death, from a tumour on the brain, of Prof. Francis Edwin Armstrong, M.Sc., A.M.I.C.E., Professor of Mining, Sheffield University, at the age of 42 years.

MR. ERNEST COATES, M.I.E.E.—The death has occurred under tragic circumstances, at his house at Streatham, of Mr. Ernest Coates, M.I.E.E. According to the first details appearing in the Press, he and the three other members of his household met their deaths through drinking poisoned champagne. Mr. Coates, who was 46 years of age, is stated to have been engaged in business as a commission agent in the City.

NEW COMPANY REGISTERED.

Talbot & Lobley, Ltd. (177,413).—Private company. Registered October 21st. Capital, £3,000 in £1 shares. To carry on the business of consulting, electrical, and mechanical engineers, implement and machinery manufacturers, &c. The permanent directors are: H. J. Talbot, Southill Mansions, Hampstead, N.W.; H. D. Lobley, 122, Albury Road, Leiston, Suffolk, with power to appoint an ordinary director. Qualification: One share. Remuneration of permanent directors: £500 each per annum. Registered office: 57, Victoria Street, Westminster.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

G. Hands & Co., Ltd.—Debenture dated October 5th, 1921, to secure £2,000, and further moneys not exceeding £1,550 which the mortgagee may be called upon to pay under a certain guarantee, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: G. Hands, 69-71, Farringdon Road, E.C.

Fuller's United Electric Works, Ltd.—Debentures dated October 11th, 1921, to secure £15,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: National Bank of Scotland.

Gilbert Gilkes & Co., Ltd.—Satisfaction to the extent of £1,000 on September 30th, of debentures dated March 23rd, 1921, securing £4,700.

CITY NOTES.

Drake and Gorham, Ltd.

At the annual meeting, held on October 27th, Mr. B. M. Drake said that in spite of the crisis through which the country had been passing, including the coal stoppage and an electricians' strike, they were still able to declare a six per cent. dividend after making allowance for the depreciation which had taken place in their stock. During the 20 years of the company's existence the total profit had exceeded £200,000, of which £134,460 had been distributed amongst the shareholders, this being £9,460 more than the amount subscribed. It was a tribute to the reputation of the company that the issue of 7-year notes was so largely oversubscribed; no outlay for underwriting was incurred. The E.P.D. and Corporation Profits Tax, paid or reserved, had amounted to no less than £17,000, a large proportion of which related to peace requirements. Although they would in future be released from the former tax, the latter, amounting to five per cent. of the profits, still continued. If, as reported, the metal workers in Germany were now putting in full work for the equivalent of 15s. to £1 per week, it was difficult to see how this country could compete when paying anything approaching the present rate of salaries and wages. Before normal conditions could be restored, the general standard of living must be lowered, and labour must be more willing to give proper value for wages received. With heavy taxation and lack of dividends, the number of those who could afford to install electric lighting was necessarily reduced. On the other hand, the use of electric power was daily extending in connection with domestic labour-saving appliances, the utility of which was more in evidence owing to the difficulty of obtaining servants, and as electricity was rendered more widely available, the adoption of such appliances would become more universal. It would be essential for manufacturers who wished to keep themselves up to date, to consider the problem of utilising electric power throughout their works. The severe competition might in the end prove a godsend, as before the war it was found that both Germany and America were using about three times as much horse power per man employed in factories as was used in Great Britain under similar conditions. This was largely due to the senseless opposition of the Trade Unions to labour-saving appliances. It was hoped that those controlling the policy of labour might now appreciate that it was only by the increased use of machinery that our trade could be recovered, and that there was sufficient demand to keep everyone employed indefinitely if satisfactory goods were produced at competitive prices, a result which could not be achieved with hand labour. The company's Manchester office had done exceedingly well, and had in hand important power equipment work in factories as well as a number of private installations. The head office was fully occupied for the first part of the year, but the effects of the depression appeared to have been felt earlier in the Southern than in the Northern counties. The Belfast office showed a small profit in spite of the prevailing difficulties. At the present time many were holding back their orders in the hope of obtaining lower prices, and the effect of this was to intensify the troubles caused by the lack of export trade. It should be considered a national duty for everyone to help the Government by putting in hand forthwith any work they could, and even if they paid rather more for this, it must be borne in mind that they would be getting something they wanted, and at the same time reducing the amount they would have to pay in taxation to meet grants made by the State. They would also be putting money into the pockets of men who were willing to work for their living. The Trade Unions should support this policy by encouraging those out of work to accept temporarily a lower rate of pay.

Spanish Electrical Companies.

Union Electrica Viscaina.—The accounts presented at the last meeting of this company showed an available balance of 2,480,993 pesetas, which was distributed as follows: To sinking fund, 50,000 pesetas; payment of 4 per cent. on coupon No. 12, 688,600 pesetas; 5 per cent. on coupon No. 13, 860,750 pesetas; taxes, 270,000 pesetas, leaving a balance of 611,643 to carry over to next year's account.

Electra-Metalurgica del Ebro.—The report of this company for the year 1920 showed the series of difficulties with which it had to contend, with overstocked markets, temporary stoppage of exports, a two-months' strike of workmen, and working only possible for six and a half months owing to the drought causing the lowering of the waters of the Ebro. Notwithstanding these hindrances, the liquid profits totalled 410,190 pesetas, from which, after placing 100,000 pesetas to the reserve fund and liquidation of taxes, a dividend of 35 pesetas per share on the 7,000 shares was declared. The company has increased its capital to 7,000,000 pesetas.

English Electric Company of Australia, Ltd.

The *Sydney Morning Herald* for September 7th stated that the English Electric Co. of Australia, Ltd. (late Standard, Waygood, Hercules, Ltd.), announced that the option given to the English Electric Co. over 100,000 of the ordinary shares of the English Electric Co. of Australia, Ltd., at 2s. a share, had not been exercised, and had been cancelled. The sale of debentures, which it was hoped would provide new workshops at Clyde, had resulted in £118,100 being applied for. The workshops had already cost £150,000, the additional amount having been provided out of profits. Another £50,000 was required to complete the workshops. The Australian company was, therefore, asking shareholders to grant power to make an issue of £47,520 in ordinary shares to shareholders in the proportion of one new share for every five shares held. These shares were to be issued at par. For every two shares so taken up the shareholders were to receive one fully-paid £1 share in Weymouths, Ltd., Melbourne, as a bonus. This bonus was provided by the English Electric Co. of Australia out of profits. It was also proposed to extinguish the "A" ordinary shares, numbering 100,000, which were issued to obtain certain rights. They have been purchased by the directors as individuals, the purchase price being £10,000. They represented goodwill, and by transferring £10,000 from the reserve fund to pay for them they were to be extinguished, and the goodwill was to be written off.

Auckland Electric Tramways Co., Ltd.

At the recent annual meeting, Mr. C. G. Tegetmeier, in referring to the financial position, said that a year ago he informed them that £117,700 of the 5½ per cent. debentures had been disposed of, and during the year a further amount of £154,800 had been sold, realising an average price of 90¼ per cent., and reducing the total held to the amount shown in the balance sheet. The proceeds of these sales had provided them with funds which had been utilised in redeeming their own debenture stock, and at the date of the balance sheet had left them with cash resources of £72,724. For some months past the sale of the Corporation debentures had been discontinued, for the board had not considered it advisable to sell at the lowered price which would have had to be accepted. With regard to the general position of the company, he dealt fully in October last year with the change in the financial position and assets of the company resulting from the sale of the undertaking to the Auckland City Council. The policy then laid down of continuing the company in being with a view to its gradual and eventual liquidation at the time and in the manner that was likely to produce the best results as the alternative to the winding up of the company and the realisation and distribution of its assets, met with the general approval of the shareholders. Progress had been made in carrying out this policy during the past year.

Gwynnes Engineering Co., Ltd.—According to the *Financial Times*, the accounts for the period ended August 31st, 1921, show a loss of £103,164. After payment of general expenses, interest, repairs and renewals, and the writing off of sums amounting in the aggregate to £82,242 in respect of depreciation on buildings, machinery, &c., and all preliminary and formation expenses, there is a deficit of £351,887 to be carried forward.

Tramways, Light & Power Co., Ltd.—Special meetings have been called for altering the name of this company to the Midland Counties Electric Supply Co., Ltd., and increasing the borrowing powers to £1,000,000, so that an issue of debenture stock may be made to repay temporary borrowing.

Electric Welding Co., Ltd.—A financial contemporary reports that the accounts for the year ended November 30th, 1920, show a balance at debit of profit and loss of £46,364.

City of Buenos Ayres Tramways (1904) Co., Ltd.—Dividend of 1s. 3d. per share (being at the rate of 5 per cent. per annum), less tax, for the three months ended September 30th.

Stanton Ironworks Co., Ltd.—Interim dividend of 4 per cent., free of tax.

Capital Increases in Germany.—The prospectus issued by the Bergmann Electricity Works Co., in connection with the introduction of new shares for 20,000,000 marks on the Frankfort Exchange, states that the turnover in the expired months of the present financial year has exceeded that in the same period of the previous year, and the orders on hand will keep the works occupied during the remainder of the year. The directors of the German Cable Works Co., of Berlin-Lichtenberg, have convened a special meeting to authorise an increase of 22,000,000 marks in the share capital, and the Rheydt Cable Works Co. also proposes to augment its share capital. In addition, an expansion from 8,500,000 to 15,000,000 marks is projected by the Light & Power Co., of Munich.

Yates & Thom, Ltd.—Dividend of 5 per cent., less tax, on the ordinary shares; £10,000 to reserve; carry forward £15,084.

Stock Exchange Notices.—Dealings in the following securities have been specially allowed by the Stock Exchange Committee under Rule 148a:—

Fellows Magneto Co.—124,237 ordinary shares of 10s. each, fully paid, Nos. 100,001 to 224,237.

South Metropolitan Electric Light & Power Co.—45,000 ordinary shares of £1 each, fully paid, Nos. 120,001 to 150,000 and 400,001 to 415,000; and £43,300 four and a-half per cent. first debenture stock.

STOCKS AND SHARES.

Tuesday Evening.

The railway companies have lost no time in putting forward their plans for electrification of fresh and existing lines with the intention of obtaining assistance from the Government in connection with the unemployment schemes. The companies want to take advantage, of course, of the opportunity for obtaining money at a reasonable rate from the Government, and they point to the large amount of labour which they could absorb into the work for a fairly long time. Reference was made here last week to the proposals of the Underground Electric Railways of London, and over the week-end the South-Eastern Co. put forward a comprehensive electrification plan, while the Brighton and the Great Eastern have similar suggestions on hand that may assume definite shape before these notes are out. The Government has just offered 20 million pounds local loans 3 per cent. stock at 52; some of the money will be hypothecated towards the necessities arising out of unemployment. Subscription of the full amount is guaranteed by the loan being underwritten, and the money will shortly be available for public use.

The investor in existing securities of the companies mentioned derives no immediate benefit from the proposals. Underground Electric Income Bonds, to take one example, fell to 67½, a drop of 2 points, although the price rallied to 68¼. Both classes of shares are lower. Metropolitan and Metropolitan District stocks have lost 10s. London General Omnibus 5 per cent. income debenture stock can be bought at 61. The natural fear is that if large amounts of money are to be raised, the new securities will take precedence of existing stocks and shares. Moreover, the opposition that has arisen to Lord Ashfield's request for a limited period free from fresh competition, is another cause that keeps people a little uneasy. The L.C.C. programme, under which it is sought to take powers for borrowing five million pounds wherewith to build Tube railways, is regarded with interest rather than anxiety.

In the list of electricity supply shares, the week's changes are confined to a fall of 5s. in Bromptons and a rise of sixpence in City of London ordinary. The new County of London debenture is up to 6 premium. Our list last week of preference shares has apparently proved useful, and it may be of service to add another table giving the details of debenture stocks in the London companies:—

Debenture.	Int. %	Payable.	Price.	Yield. £ s. d.
Central Elec. Guaranteed	4	J. & D.	73	5 9 7
Charing Cross, West End, & City..	4	J. & J.	65½	6 2 2
Chelsea Electric	4½	J. & J.	75	6 10 0
City of London..	5	J. & J.	81½	6 2 8
,, ,, 2nd	4½	J. & J.	68½	6 11 5
County of London	4½	J. & J.	69½	6 9 6
,, ,, 2nd	4½	M. & N.	68	6 12 4
,, ,, Red. ..	7	A. & O.	100	7 0 0
Kensington and Notting Hill ..	4	A. & O.	73½	5 8 10
London Electric 1st Mort.	4	J. & J.	70	5 6 3
Metropolitan Elec. 1st Mort. ..	4½	J. & J.	69	6 10 5
,, ,, Mort	7½	J. & J.	99	7 0 0
,, ,, Ext.	7½	J. & J.	102	7 7 1
Midland Electric 1st Mort... ..	5	J. & J.	86½	6 4 3
North Metropolitan	5	A. & O.	79½	6 17 11
,, ,, ...	7½	J. & J.	103	7 5 8
Notting Hill Electric 1st	4	M. & S.	60	6 13 4
St. James' and Pall Mall	5½	J. & J.	66	5 6 1
South London 1st	5	J. & J.	77½	6 9 0
South Metropolitan 1st	4½	A. & O.	71½	6 8 10

It must be added that not all of these are actually on offer. Some are easier to sell than they are to buy, but even stockholders like to see how their securities stand in relation to

other issues, and the above table is comprehensive in giving prices that are not frequently quoted, owing, of course, to the limited character of the market in most of the stocks.

The River Plate Electric Co. is offering to receive tenders from its holders of 5 per cent. debenture stock, at 80¼. As the stock can be sold in the market at 81¼, there is no object in taking advantage of the company's offer.

Marconis are a better market at 32s. 6d., and Marconi Marines, after dipping to 15s. 6d., recovered to 71s. 3d. There are very vague rumours current to the effect that important wireless developments are taking place in Germany, and that a remarkable improvement in speeding-up messages is on the point of being announced. The report is mentioned merely for what it may be worth. In the cable group, Eastern ordinary stock has come to market, and the price fell 2 points. Indo-Europeans at 30 ex dividend have nominally recovered the deduction.

Most of the manufacturing shares remain depressed. General Electrics are down to 13s. 9d., English Electrics to 7s. 6d., and Edisons to 6s. 3d. The last-named have been 5s. 6d. Henley's gave way to 26s. 3d. Babcock & Wilcox at 45s. regained their dividend, the iron and steel list being a shade harder as a whole. In armaments, Vickers rose to 11s. 3d., but parted with the pence. Rubber shares are practically stagnant.

In Mexicans there is nothing new to record. British Columbia Electric stocks have weakened, Argentines keep steady, and Brazilian Tractions are a little firmer after their long decline. Stock Exchange markets have plucked up a grain of courage in the hope that the latest offer of the Soviet Government may indicate a return to its senses of the ruling power in Russia. The foundation for such optimism is admittedly unstable.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1919.	Dividend 1920.	Price Oct. 31, 1921.	Rise or fall.	Yield, p.c.
Home Electricity Companies.					
Brompton Ordinary	12	12	6½	— ½	£9 16 0
Charing Cross Ordinary	7	8	4⅜	—	9 2 4
do. do. do. 4½ Pref.	4½	4½	3⅛	—	7 4 4
Chelsea	4	6	3½	—	9 4 8
City of London	13	14	2⅞	+6d.	10 9 6
do. do. 6 per cent. Pref.	6	6	17/6	—	6 17 2
County of London	8	8	8⅛	—	9 10 4
do. do. 6 per cent. Pref.	6	6	7¼	—	7 10 0
Kensington Ordinary	7	9	4⅜	+	9 14 6
London Electric	2½	2½	1	—	7 10 0
do. do. 6 per cent. Pref.	6	6	3	+	10 0 0
Metropolitan	6	7	3⅞	—	9 0 8
do. 4½ per cent. Pref.	4½	4½	2⅛	—	7 13 2
St. James' and Pall Mall	12	12	6⅜	—	9 1 4
South London	6	7	2⅜	—	10 18 2
South Metropolitan Pref.	7	7	15/9	—	8 17 10
Westminster Ordinary	10	10	5⅛	—	8 13 10
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	84xd	—	7 2 10
do. Def.	1½	1½	17½	— ½	8 14 0
Chile Telephone	6	6	5⅝	—	5 14 8
Cuba Sub. Ord.	7	7	7	—	10 0 0
Eastern Extension	10	10	16¾	—	6 1 0
Eastern Tel. Ord.	10	10	164½	—2	6 1 7
Globe Tel. and T. Ord.	10	10	16⅝	— ⅛	6 1 0
do. do. Pref.	6	6	9½	—	6 9 9
Great Northern Tel.	22	24	24½	+ ½	9 16 0
Indo-European	10	10	30xd	+ ½	8 6 8
Marconi	25	15	13	+ ⅛	9 4 8
Oriental Telephone Ord.	12	12	9	—	*8 0 0
United R. Plate Tel.	8	8	5½xd	—	*7 5 6
West India and Panama	Nil	Nil	5/-	—	Nil.
Western Telegraph	10	10	10⅛	—	*6 1 0
Home Rails.					
Central London Ord. Assented	4	4	49½	—	8 1 8
Metropolitan	1½	1½	22⅝	— ¼	6 13 4
do. District	Nil	Nil	16	— ¼	Nil
Underground Electric Ordinary	Nil	Nil	1½	— ¼	Nil
do. do. "A"	Nil	Nil	4/6	—6d.	Nil
do. do. Income	4	2	68½	—1	*4 7 4
Foreign Trams, &c.					
Anglo-Arg. Trams, First Pref.	5½	12½	28	—	10 9 6
do. do. 2nd Pref.	Nil	5½	2⅛	—	10 4 8
do. do. 5 % Deb.	5	5	83½	—	7 7 0
Brazil Tractions	Nil	Nil	27½	+ ¼	Nil
British Columbia Elec. Rly. Pfce.	5	5	59	—1	8 9 6
do. do. Preferred	5	93/-	81½	— ½	*9 4 0
do. do. Deferred	8	134/-	82	—2	*12 4 0
do. do. Deb.	4½	4½	63	—	7 1 8
Mexico Trams 5 per cent. Bonds	Nil	Nil	67	—	—
do. 6 per cent. Bonds	Nil	Nil	87	—	—
Mexican Light Common	Nil	Nil	10	+1	Nil
do. Pref.	Nil	Nil	25	—	Nil
do. 1st Bonds	Nil	5	53½	—	9 10 6
Manufacturing Companies.					
Babcock & Wilcox	15	16	2½xd	+⅛	7 2 8
British Aluminium Ord.	10	10	14/3	—	—
British Insulated Ord.	15	15	1¼	—	10 0 0
Callenders	15	15	13xd	—1d.	10 8 8
" 6½ Pref.	6½	6½	18/9	—	6 1* 8
Crompton Ord.	10	10	14,6	—	13 15 10
Edison-Swan	10	—	6/3	—6d.	—
do. do. 5 per cent. Deb.	5	5	68	—	7 7 1
Electric Construction	10	10	16/9	—	16 17 0
English Electric	8	8	7/6	—1/-	21 6 8
Do. Pref.	6	6	11/3	—	10 13 4
Gen. Elec. Pref.	6½	6½	16/-	—	7 8 6
do. Ord.	10	10	13/9	—1/8	14 11 9
Henley	15	15	1⅝	— ⅛	11 8 6
do. 4½ Pref.	4½	4½	3½	—	6 13 6
India-Rubber	10	—	1/3	—	—
Met.-Vickers Pref.	8	8	1⅛	—	8 16 8
Siemens Ord.	10	10	1	—	*10 0 0
Telegraph Con.	20	20	21½	—	*5 11 9

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, November 2nd.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic per lb.	7¾d.	1¼d. inc.
a Ammoniac Sal per ton	£65	..
a Ammonia, Muriate (large crystal) "	£58	..
a Bisulphide of Carbon "	..	..
a Borax "	£31	..
a Copper Sulphate "	£30	£1 dec.
a Potash, Chlorate per lb.	6d.	..
a " Perchlorate "	6d.	..
a Shellac per cwt.	£16 10s.	..
a Sulphur, Sublimed Flowers "	£16	..
a " Lump "	£15	..
a Soda, Chlorate per lb.	3½d.	..
a " Crystals per ton	£7	..
a Sodium Bichromate, casks per lb.	7½d.	..
METALS, &c.		
g Babbitt's Metal Ingots per ton	£90 to £275	..
c Brass (rolled metal 2" to 12" basis) per lb.	10¾d.	..
c " Tubes (solid drawn) "	1/0½ to 1/0½	½d. dec.
c " Wire, basis "	11½d.	..
c Copper Tubes (solid drawn) "	1/2½	½d. dec.
c " Bars (best selected) per ton	£101	£2 dec.
c " Sheet "	£101	£2 dec.
c " Rod "	£101	£2 dec.
d " (Electrolytic) Bars "	£75	..
d " " Sheets "	£145 10s.	..
d " " Wire Rods "	£91	..
d " " H.C. Wire per lb.	11d.	..
f Ebonite Rod "	3/6	..
f " Sheet "	3/-	..
a German Silver Wire "	2/9	..
h Gutta-percha, fine "	12/6	..
h India-rubber, Para fine "	1/2	..
f Iron Pig (Cleveland Warrants) per ton	Nom.	..
f " Wire, galv. No. 8, P.O. qual. "	£29	£3 dec.
g Lead, English Pig "	£24 15s.	..
g Mercury per bot.	£9 15s. to £10	..
e Mica (in original cases) small per lb.	8d. to 3/-	..
e " " " medium "	4/- to 8/-	..
e " " " large "	10/- to 20/- & up	..
g Phosphor Bronze, plain castings "	1/4 to 1/9	..
g " " rolled bars and rods "	2/1 to 2/6	..
g " " rolled strip & sheet "	2/1 to 2/7	..
d Silicium Bronze Wire per lb.	1/3,	..
r Steel, Magnet, in bars "	1/8	..
a Tin, Block (English) per ton	£154 10s.	10/- to 30/- dec.
a " Wire, Nos. 1 to 18 per lb.	3/6	..
g White Anti-friction Metals per ton	£65 to £275	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
p ———
r W. F. Dennis & Co.

Hydro-electric Developments in Sardinia.—During the recent debate on unemployment the Government accepted an order of the day expressing the hope that on the resumption of parliamentary work it would bring in a Bill for the purpose of allotting funds towards the construction of new hydro-electric plant in Sardinia. As long ago as 1907 the question of forming artificial lakes for irrigation purposes was taken up and one of them, at Tirso, is on the way to completion; steps have also been taken for the formation of another lake at Coghinas. The first-named lake has a capacity of 416 million cu. m. of water, and the estimated capacity of the second is 254 million, which will place them among the largest artificial lakes in the world. The well-known engineer, Signor Angelo Omodeo has proved with exact data that the total capacity of all the reservoirs in Sardinia would amount to 1,500 million cu. m., from which 100,000 h.p. could be produced and 100,000 hectares of land irrigated.

According to other calculations, the Tirso, Coghinas, Temo, and Flumendosa installations of hydro-electric plant alone would furnish about 500 million kWh per annum, to produce which by steam would cost not less than 400 million lire annually in combustibles. Of the energy thus produced one-fourth would be absorbed by local demands for the purpose of lighting, railway traction, agricultural works, &c., while the remaining three-fourths would serve to give an impulse to the electrical and metallurgical industries, and could be applied especially to a more economical production of metals.

The mining industry of Sardinia, in spite of the disadvantageous circumstances in which it works, is of such importance that its output forms more than a quarter of the entire Italian production. Of zinc alone 200,000 tons are produced yearly, but the prosperity of the industry is limited by the fact that this great quantity of mineral is exported to Belgium, Great Britain, and France for manufacture. If hydro-electric power were available, the zinc, instead of being exported, and reimported in the finished state, could be manufactured on the island itself; in the same way the iron ore which abounds might be utilised for the production of pig iron.—*Reuters' Trade Service* (Milan).

THE RATING OF MACHINERY.

[By A Legal Contributor.]

At a time when many of those who own factories in different parts of the kingdom are at a loss to know how to make both ends meet, the question of "rating" and "rateable value" assumes very considerable importance. A factory is not like an inhabited house, the assessment of which is a comparatively easy matter, because the "hypothetical rent" can be easily determined. A variety of new considerations arise when a great building full of machinery has to be assessed. Nor has the legislature done much to assist those who have to fix the amount. It has been out of date for many years. In particular, so far, at any rate, as England and Wales are concerned, the question whether machinery is rateable *at all* has been left to be somewhat imperfectly solved by the decisions of the Courts.

The need for some definite rule on this point is emphasised by a recent decision in Glasgow, where the Lanarkshire Valuation Committee had to settle the rateable value of the property of certain Lanarkshire steel makers. The importance of that case will be apparent after we have drawn attention to the present state of affairs in England.

The whole principle of rating is founded upon the Parochial Assessments Act, 1836, the first section of which provides that "no rate for the relief of the poor in England and Wales shall be allowed by any justices or be of any force which shall not be made upon an estimate of the net annual value of the several hereditaments rated thereunto—that is to say, of the rent at which the same might reasonably be expected to let from year to year, free of all usual tenant's rates and taxes, and tithe commutation rent charges, if any, and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain them in a state to command such rent. Provided always that nothing contained herein shall be construed to alter or affect the principles or different liabilities, if any, according to which different kinds of hereditaments are now by law rateable."

Although the above provision has been subjected to some modification in its application to the Metropolis, is may be stated broadly that "the net annual value," or "the rent at which premises may be reasonably expected to let from year to year," sometimes called the "hypothetical rent," is the groundwork of every rate. How, then, is this hypothetical rent determined? That is the problem with which every Assessment Committee has to deal, and which presents unusual difficulties in connection with buildings having valuable machinery within them.

It is another elementary principle of rating that chattels are not rateable *per se*. Hence it is not unnatural to find that occupiers of factories have contended from early times that the machinery upon their premises must not be taken into consideration by those who have to determine the rateable value. Machinery, it has been urged, resembles furniture and other movable chattels; nothing but the hereditament alone, which comprises the four walls of the factory, is to be regarded. Now it is obvious that if "factory and machinery" are to be included in the term "hereditament," the hypothetical rent is increased enormously, and the rateable value of property at the disposal of the Assessment Committee is enlarged *pari passu*. In these circumstances it is not surprising that the wider construction has been adopted by the Assessment Committees, Courts of Quarter Sessions, and the higher Court of Justice, upon which the duty of interpreting the above statute has very properly devolved.

The leading case upon the subject is the Tyne Boiler Works Co. *v.* Overseers of Longbenton.

The facts of this case, which may well be termed a leading authority, were shortly these: The appellants (against a rate) were the occupiers of premises known as the Tyne Boiler Works. Certain machinery and plant of a heavy nature, including an engine, boiler, shafting, travelling cranes, and other machinery (the property of the appellants) had been placed upon the premises, and were required by the appellants for the purposes of boilermaking. They came under the same category as millstones in a mill, which would pass by a demise of the mill. The machinery in question could be moved and rearranged as desired. Some of the machines were not attached either to the soil or to the building; others were what are known as fixed machines. The Assessment Committee ascertained the rateable value of the premises by taking the gross estimated rental which a tenant from year to year might reasonably be expected to give for the use of them, inclusive of the machinery and plant, and by making the usual statutory deductions. The appellants contended that the machinery and plant were not any of them part of the freehold or hereditaments, but were chattels, and that they were not, nor were any of them, rateable, or to be taken into consideration as enhancing the rateable value of the premises. The Court of Appeal, however, refused to adopt this argument. The late Lord Esher thus expressed himself in giving judgment: "The rule as above enunciated has been recognised in Courts of Justice ever since 1886, but, although the rule is universally adopted, methods of applying it are not always identical. The reason for this lack of uniformity is not far to seek, if the rule itself is carefully examined. What does it amount to? It says: "Machinery is to be taken into consideration for the purpose of enhancing the value of the premises; but there it stops. No criterion is given whereby the enhancing value of machinery is to be determined, and it is definitely laid down that machinery cannot be rated separately." Thus the late Lord Justice Lopes, another member of the Court which decided the above case, said: "It is clear that personal property, such as machinery, is not *per se* rateable." A rule is laid down, but the method of applying it is not described.

The result is that there is no uniformity in the application of the law of rating to factories which contain valuable machinery. The state of things now existing is described in the phrase, *Quot homines tot sententiæ*, where *homines* represents Union Assessment Committees and *sententiæ* the various methods which they have adopted in order to render the owners of machinery rateable in respect of that property for the relief of the poor. It is a paradox that machinery should be declared not rateable, and that it should, at the same time, come into rating. But this is not the only anomaly in respect of which the present law requires amendment. It seems that if the Assessment Committee or other rating authority discloses the fact that in arriving at the rateable value of a factory it has valued the machinery separately, the rate will be declared invalid.

The most authoritative pronouncement of the law on this subject is to be found in the case of Kirby *v.* the Hunslet Union, which was tried before the Recorder of Leeds in April, 1904, and was finally adjudicated upon by the House of Lords on December 18th, 1905 (Sec. 22, *The Times Law Reports*, page 167). The appellant was an occupier from year to year under an expired tenancy of some engineering works at Hunslet, at a rental of £28 per annum. He appealed against an assessment of £67 gross and £45 rateable value, the previous assessment being £29 and £22 respectively. The appellant contended that the value to the user of certain machinery in connection with the occupation of the premises ought not to be considered, but that the question of the benefit ought to be limited to the advan-

tage derived from the fact that the machinery afforded proof of the convenience of the building for the purpose of the business, and a possible value from the tenant being able to take it *in situ*. The respondents, on the other hand, said that the only way in which it could be properly taken into account was by taking the hereditament as found, furnished and equipped with the necessary machinery, and ascertaining what was the rent which the tenant from year to year would give for such premises as they stood, including, of course, the right to use what he found there. Two objections were raised to this: That it involved (*a*) the rating of machinery, and (*b*) that the tenant bought the machinery and had to pay the landlord rent for it. Upon these points the learned Recorder said: "I think the answer is that to take the value which machinery may add to the letting value of the premises is not to take the value of the machinery. The added rent has no relation to the value of the machinery. . . . The second point urged was that the tenant buys the machinery, and yet has to pay the landlord rent for it. I think this involves the consideration of the facts of the particular tenancy in question, which I think is fallacious. . . . I am of opinion, therefore, that the principle by which rateable value is to be ascertained is that in ascertaining the rent you must take into account the value of the machinery as contributing to the rental value of the freehold." In the event, he made the assessment £31 gross and £26 net. The case ultimately reached the House of Lords, where the opinion of the Recorder was adopted. Lord Halsbury said: "For half a century or more the judges have recognised the fact that, though the machinery is not so affixed as to become actually part of the land, yet if the whole premises are occupied with machinery in such a manner that the whole becomes a factory, the entire concern becomes a suitable subject of rating, and the machinery ought not to be disregarded in fixing the amount of the assessment."

In the case just mentioned, the learned Recorder had no option. He took the course which many another Recorder will take, namely, that of considering the valuation made by the appellants, and that made by the respondents, and taking the mean between them, guided, of course, by the opinions of the expert witnesses. Apparently all that a manufacturer can do to protect his interests under the existing law is to see that the machinery is not taken into account separately.

In another case (Greenwood & Batley, Ltd., *v.* Bramley Union) the method by which the overseers should endeavour to arrive at the rateable value was stated. The material facts were very brief. Messrs. Greenwood and Batley were rated in respect of their Albion Works at £10,134 gross and £6,050 net. They appealed against this rate on the ground that it was simply 5 per cent. of the estimated value of the buildings and machinery. The overseers denied that this method of arriving at the rateable value had been adopted.

The question for the Recorder was: How are machinery and buildings to be rated together? The firm pointed out that the value of the machinery *per se* was no criterion, because everything depended upon the adaptability of the premises for a particular machine. Here the premises were inconvenient and unsuitable, having regard to the processes carried on. The Recorder of Leeds, in giving judgment reducing the rate, said: "It is impossible to lay down a principle which will go anywhere near settling other cases which come up for decision; it is purely a practical question. I suggested in my original decision in the Hunslet case that in my judgment it was not a question of taking the capital value and getting a percentage upon it, and I am still of the opinion. What is the true determining factor in the case of rent which is to be added in consequence of the presence of machinery in a mill? That is a practical question. What extra amount will a practical tenant engaged in that particular trade when he comes to look at the premises, in his own mind, add to the rent by reason of the machinery which he sees upon the premises? One practical man has been called here, namely, Mr. Maclaren. . . . He says that in his opinion the additional rent to be attributed to the machinery in this case would be, as he said in the first instance, about 100 per cent. He subsequently qualified that by putting £3,600 as the rent of the buildings. I take that as including the rent of the land. He adds £3,000 additional rent owing to the presence of the machinery. . . . This is a guide to me certainly in coming to a conclusion as to what, to the best of my judgment, is a proper additional rent. . . . In effect, he says: 'Add 80 per cent. to the value of the land.' I take £4,970 as the rent which would be given for the land and buildings. I add 80 per cent., namely, £3,976, as the amount by which the rent would be enhanced owing to the machinery. That makes a gross rateable value of £8,946. Deducting £4,074 for statutables, the net rateable value is £4,872, and I reduce it to that amount with costs."

This is a decision which no manufacturer who is appealing against his rates can afford to ignore. The practical man is wanted to give evidence in rating cases where machinery is concerned.

We now come to the Scotch case which is referred to at the commencement of this article. That the matter was of some importance appears from the figures. The assessment of 18 steel works was in question. Their aggregate valuation in 1919 was £104,586. It was proposed to increase this figure to £336,394 for 1921. In the revised valuation cognisance was taken of the enormous developments which had taken place during the war period, but the ratepayers contended that the works would not stand, economically, rents corresponding to the assessors' valuation. With this larger question we are not here concerned. Indeed, the decision of the Commissioners upon them is not before us; what are of interest, however, are certain "rulings" as to the assessability of certain classes of machinery. In Scotland, by an Act passed in 1854, all machinery fixed or attached to any lands or heritages was made rateable, and by an Act passed in 1902, it was declared that, "in any building occupied for any trade, business or manufacturing process, the expression 'machinery fixed or attached' shall be construed as including all machinery, machines, or plant in or on the lands or heritages for producing or transmitting first motive power, or for heating or lighting such building, but, save as herein provided, shall not include machine tools, or appliances which are only so fixed that they can be removed from their place without necessitating the removal of any part of the building."

The following machines, &c., were declared to be assessable: Perforated plates lying on foundations; a large shearing machine; uprights and gantries for travelling cranes outside. The following were held not assessable: Sleeper flooring, loose plates laid on the floor or ground; sand bunkers; iron screens, loose rails, and iron rods; machinery or timber, brick, or concrete, even if held by a rag bolt; pivoted charging machinery, gantries, and travelling cranes inside. To electrical engineers the most interesting of these rulings are those which relate to motive power. The chairman said: "The turbine is assessable, the generator is not. As to the rotary converter, having given our decision on the motor generator, it might be thought that we could split the rotary converter, but we have decided we cannot, and the rotary converter is assessable. Lighting sets as such are assessable, but in connection with the light taken from a power plant, the amount which goes for lighting is so small in comparison with the whole that we cannot split it, and it is not assessable."

Whatever may be said as to the wisdom or propriety of rating machinery at all, it is at any rate satisfactory to have a definite catalogue of machines which are assessable. As has been shown by our review of the English law, machinery in England is taken into account by rating authorities, but in so vague and general a way that no machinery owner knows precisely where he is. Uncertainty, however, is not a characteristic of this point of the law of Scotland.

ELECTRICITY SUPPLY IN THE UNITED KINGDOM.

REPORT OF THE ELECTRICITY COMMISSIONERS.

(*Continued from page* 583.)

Sanction to Borrowing by Local Authority Undertakers.—Under the provisions of the Act of 1919 the powers formerly exercised by various departments with respect to the sanctioning of borrowing by local authorities in connection with the supply of electricity were transferred to the Electricity Commissioners. It is laid down, however, that in exercising the powers so transferred, the Commissioners shall act in consultation with the former sanctioning authorities. It appeared to the Commissioners that considerable inconvenience and delay would be caused if every application for sanction to borrowing were referred to the former sanctioning authority before a decision could be given. An arrangement was therefore entered into whereby consultation was limited to cases in which the electricity supply undertaking of a local authority involved a charge on the local rates, or where the proposed expenditure was likely to involve such a charge, and in the administrative County of London in certain other special cases. The practice and procedure followed by the former sanctioning authorities differed in many respects, and the first action taken by the Commissioners was to consider how far it was possible to secure uniformity in the treatment of applications received from various portions of the United Kingdom. In this connection, however, it was found that certain difficulties existed owing to the differences between the provisions of the Acts applicable to borrowing by the various local authorities.

After a full review of the past practice, the Commissioners decided to adopt as a general basis the principle of sanctioning separate repayment periods determined by the estimated life of the various assets concerned, and to simplify the system hitherto prevailing in England and Wales by grouping the assets and lessening the number of separate periods. After consultation with the Incorporated Municipal Electrical Association, the Commissioners fixed a scale of maximum periods for the repayment of loans, the main items of which are given in Table 3.

Table 3.—Periods Allowed for Repayment of Loans.

Purpose of Expenditure.	Maximum Periods. Years.
Land :—	
Freehold	60*a*
Leasehold (subject to duration of lease)	30
Substantial buildings	30
Plant and machinery	20
H.p. trunk transmission mains	40*a*
Overhead lines	25
Mains and services	25
Meters	10
Wiring of premises	10
Apparatus to be let on hire	7-10

(*a*) Note.—Except in Scottish cases, for which the present maximum period is 30 years.

By reason of their powers as the loan sanctioning authority for electricity supply purposes, the Commissioners are in a position to exercise an important measure of control over the development of the electricity undertakings of local authorities, preventing as far as possible unnecessary expenditure, and safeguarding the interests of future ratepayers.

During the period January 31st, 1920, to March 31st, 1921, the Commissioners received 536 applications for sanction to borrowing by local authority undertakers, inclusive of applications transferred to the Commissioners from the former sanctioning authorities. Of these applications the Commissioners sanctioned 432, either in full or in part, and 29 others were refused or withdrawn, or transferred to other departments. Sanctions were issued to 204 out of the 284 local authorities owning electricity undertakings, *i.e.*, to about 72 per cent. In view of their practical experience of the operation and requirements of electricity undertakings, the Commissioners as a rule found it unnecessary to hold Local Inquiries for the purpose of investigating applications for sanction to borrowing, thus saving public time and expense. In three cases, however, such Inquiries were held.

The Commissioners also received several applications for sanction to borrowing for the provision of working capital. They are only in a position to issue such sanction in Great Britain where local Acts contain definite provisions authorising borrowing for such a purpose. In the case of Irish local authorities such transactions do not require sanction. A complete list of the sanctions issued by the Commissioners up to March 31st, 1921, is given in an appendix to the Report. The total amount sanctioned was £15,181,298, the purposes for which this amount was to be expended being indicated in Table 4.

Table 4.—Analysis of Loans Sanctioned.
(Period January 31st, 1920, to March 31st, 1921.)

Purpose	Amount. £	Percentage of total.
Land	61,040	0.4
Buildings	1,267,742	8.3
Plant	9,805,990	64.6
Cooling towers	210,325	1.4
Mains and services	3,428,161	22.6
Meters	111,014	0.7
Other purposes	297,026	2.0
Total	15,181,298	100.0

The largest individual amounts sanctioned for mains and services were in respect of (*a*) Sheffield £280,000, (*b*) Manchester £263,000, (*c*) Leeds £190,000. In many cases the Commissioners were reluctantly obliged to sanction the borrowing of money for the installation of plant in small and uneconomical stations in order to enable the Local Authorities concerned to meet their statutory obligations, pending the availability of a bulk supply from a larger and better placed station. Such cases serve to emphasise the importance of expediting the improvement and reorganisation of electricity supply and the shutting down of uneconomical and badly placed stations, with the view of avoiding wasteful expenditure of capital.

Special Orders.—The substitution of Special Orders for Provisional Orders enables powers to be obtained at any time, and thus obviates the delay which frequently arose under Provisional Order procedure by reason of the necessity for publishing notices and lodging objections at stated times. The Commissioners prepared draft rules of procedure with respect to applications for Special Orders under the Act, and on August 10th, 1920, made statutory rules, which were laid before Parliament in accordance with the of 1919. The rules prescribe the mode of making application for a Special Order, the nature of the advertisements or notices to be published, the authorities and persons on whom copies of the notices must be served, the manner in which the draft Order should be prepared, the nature of the deposits to be lodged with the Commissioners and with other authorities, the procedure for lodging objections to the grant of an Order, the method to be followed in proving compliance with the Electricity (Supply) Acts and Rules, and the steps to be taken for giving public notice after the Order has been granted by the Commissioners. A fee of £35 is payable to the Commissioners to cover ordinary expenses in dealing with an application, and the applicants are also required to defray any additional expenses of the Commissioners consequent upon the necessity for holding an Inquiry or otherwise.

Four applications for Provisional Orders were transferred to the Commissioners by the Board of Trade, and were considered as if they had been applications for Special Orders, and orders were made for Panteg and St. Mellons (S. Wales Electrical Power Distribution Co.).

Up to March 31st, 1921, 98 applications were made to the Commissioners, of which a list is given in an appendix.

Orders were made in respect of Mynyddislwyn and Risca (Urban District Councils). Since March 31st ten further orders have been made.

It has been the policy of the Commissioners in dealing with applications for Special Orders to encourage well-considered schemes for the extension of distribution in areas where bulk supplies are readily available, but to discourage, as far as possible, schemes involving the establishment of small and uneconomical generating stations. In districts, however, where there is clearly a demand for electricity and no possibility of obtaining a bulk supply from another source, the establishment of a small station may be justifiable. The Commissioners have fully recognised the desirability of granting every facility for obtaining increased powers of distribution, with the view of encouraging development in areas at present without a supply of electricity.

Arrangements for Mutual Assistance and Bulk Supply Agreements.—Questions concerning the linking-up of undertakings for mutual assistance, and the giving and taking of bulk supplies, have figured prominently in applications made to the Commissioners in upwards of 80 different cases. It has been the consistent policy of the Commissioners to encourage and promote the taking of bulk supplies by local authority and company undertakers alike where this course has been ascertained to be both technically and economically justifiable. In many instances undertakers were advised or urged by the Commissioners to enter into negotiations for a bulk supply to meet pressing requirements, pending the installation of additional plant, or in preference to extending their existing generating stations. In a few cases only have undertakers shown reluctance in falling-in with the suggestions and advice of the Commissioners, and it has hitherto been unnecessary

for the Commissioners to exercise their powers under Section 19 of the Act of 1919, of requiring undertakers to enter into arrangements for mutual assistance. The Commissioners have approved of the following undertakers entering into, and carrying into effect, arrangements for mutual assistance :—

(*a*) The Corporation of Birmingham, and the Shropshire, Worcestershire, and Staffordshire Electric Power Co.

(*b*) The Corporation of Bristol and the Keynsham Electric Light and Power Co., Ltd.

(*c*) The Corporations of Nelson and Colne.

(*d*) The Metropolitan Borough Council of Bermondsey and the London Electric Supply Corporation, Ltd.

(*e*) The Metropolitan Borough Council of Hammersmith and the Chiswick Electric Supply Corporation, Ltd.

(*f*) The Metropolitan Borough Council of Woolwich and the Urban District Council of Erith.

Other applications were still under consideration at March 31st. Special reference may be made to applications in respect of the following undertakers :—

(*a*) The Corporation of Manchester and the Lancashire Electric Power Co.

(*b*) The Corporation of Wolverhampton and the Urban District Council of Cannock.*

(*c*) The Corporations of Blackburn and Darwen.†

(*d*) The Corporations of Leeds and Morley.‡

Under Section 3 of the London Electric Supply Act, 1908, the Commissioners have approved of the following undertakers entering into, and carrying into effect, agreements for mutual assistance or for association :—

(*a*) The Metropolitan Borough Councils of Battersea, Fulham, and Hammersmith.

(*b*) The Metropolitan Borough Councils of Hackney and Shoreditch.

The Commissioners have also approved of the following undertakers entering into, and carrying into effect, agreements under private Acts :—

(*a*) The Corporations of Manchester and Stockport.

(*b*) The Corporation of Wolverhampton and the Midland Electric Corporation for Power Distribution, Ltd.

Fringe Orders.—During the period January 31st, 1920, to March 31st, 1921, the Commissioners granted 70 Fringe Orders, and further applications were under consideration. A list of the authorised undertakers to whom orders were granted is given in an appendix.

Standardisation of Frequency.—The Commissioners recognised that financial considerations alone rendered it impracticable at the present time to contemplate a complete changeover to a standard frequency of 50 cycles per second in areas containing extensive developments at 40 and 25 cycles.

The Commissioners called an informal conference of engineers, at which the consensus of opinion was that it was outside the bounds of practical politics for the Commissioners to bring about the adoption in the near future of one standard frequency throughout the country, and that the most that could be attempted at present was to aim at standardising the frequency in particular districts. The Commissioners decided that it should be their policy to bring about the elimination of all odd frequencies, with the object of effecting a gradual consolidation of the prevalent frequencies in various districts, and of reducing the number of main frequencies in use to three, namely, 50 (standard), 40, and 25 cycles per second.

Systems of Supply and Regulations.—For the guidance of undertakers who desired to adopt a system requiring special approval, the Board of Trade drew up a model form of description, and this was provisionally adopted by the Commissioners. At a later stage the Commissioners made further provision in the model description for systems of supply at extra high pressure (voltages exceeding 3,000 volts) with regard to the methods allowable for the protection of mains laid in the ground. They also provisionally adopted the standard codes of Regulations made by the Board of Trade for ensuring a proper and sufficient supply of electricity, and for securing the safety of the public, including regulations with regard to the construction and maintenance of overhead lines. The provisions embodied in these codes, however, were subsequently reviewed by the Commissioners, who came to the conclusion that from the standpoint of present technical practice, revision and simplification of the codes were desirable. A draft code of revised regulations for securing the safety of the public, and for ensuring a proper and sufficient supply of electricity, was accordingly prepared by the Commissioners, and copies were forwarded to the Institution of Electrical Engineers, and the observations of a Regulations Sub-Committee of that Institution were invited on the draft. The question of revising the regulations with regard to overhead lines is still under consideration.

The Commissioners approved the adoption of special systems of supply in the case of 15 applications, and other applications are under consideration. A complete list of approvals is given in an appendix. Special reference may be made to the adoption of a pressure of 33,000 volts for the transmission of energy from Woolwich to Erith, and of a pressure of 66,000 volts for the transmission of energy between generating stations and sub-stations in the areas of supply of the Newcastle-upon-Tyne Electric Supply Co., Ltd., the Cleveland and Durham County Electric Power Co., and the County of Durham Electric Power Supply Co.

The Commissioners have given their consent to the following three undertakers altering the declared system or pressure of the supply hitherto adopted for the purposes of the undertakings, namely, the Corporations of Huddersfield, Tynemouth, and Rotherham (in respect of the Rawmarsh Electric Lighting Order, 1898).

The Commissioners have served notices, and prescribed regulations for securing the safety of the public and for the protection of the electric lines and works of the Postmaster-General, on 30 owners specified in an appendix, who have laid down or erected electric lines and works without statutory authority in the districts indicated.

Accounts, Statistics and Returns.—The Commissioners adopted and prescribed an amended form for the use of Electric Power Supply Companies authorised under Special Acts to supply in bulk and for power purposes.

The non-existence at the outbreak of war of really adequate official statistics relating to electricity undertakings in the United Kingdom was responsible for a great expenditure of time and effort on the part of the Government to secure the proper utilisation and allocation of the resources of the country. They came to the conclusion that the compilation of an annual official return was essential, and an appropriate annual questionnaire form was prepared covering such administrative, engineering, and financial particulars as experience had shown would be necessary for dealing properly with the various applications and problems under consideration. Copies of the draft form were circulated to the associations concerned, and their observations were invited. This matter had not been finally settled by March 31st.

All authorised undertakers are now required to furnish to the Commissioners every four weeks a return as to units generated, fuel consumption, &c. Returns of a similar character were instituted by the Coal Controller during the war, and in view of their utility were continued by the Electric Power Supply Department of the Board of Trade, pending the setting-up of the Electricity Commission. The new form issued in respect of the year 1921-22 contains provision for data as to stocks of fuel in hand, the utility, in an emergency, of the information returned under this heading being apparent. These returns are of considerable help to the Commissioners in dealing with various classes of applications and enable them to ascertain periodically the position with regard to the output and working of an authorised undertaking. An analysis and summary of the returns for the year ending March 31st is being compiled by the Commissioners. A table compiled from the returns in question shows that the total output of 421 electricity supply stations and 80 railway and tramway stations and non-statutory undertakings was over 5,000 million kWh, and the total coal and coke consumed was 7.36 million tons.

(*To be continued.*)

* Approval given on July 14th, 1921.

† Approval given on May 7th, 1921.

‡ Approval given on April 2nd, 1921.

THE ELECTRICAL POWER ENGINEERS' ASSOCIATION.

Annual Dinner.

On October 29th the members of the Southern Division of the Electrical Power Engineers' Association gave their third annual dinner to the National Executive Council, at the Hotel Cecil. Mr. J. H. Parker, the retiring President, was in the chair, and among a number of visitors were Mr. A. Page, one of H.M. Electricity Commissioners, and Mr. W. Wyld, lately chief electrical engineer to the Hampstead Corporation.

An excellent menu was arranged, and after dinner Mr. Page rose and proposed the toast of "The Association." He said that the Electricity Commissioners earnestly desired to keep in close touch with all movements in the industry, and it gave him pleasure to be present at this function of the E.P.E.A. The Association and the Commissioners were on common ground, both having as their aim the advancement of the electrical industry. Such an Association was absolutely necessary to raise the status of the electrical engineer. He recalled that when he, as a fully-trained engineer, received his first appointment he was rewarded with the miserable pittance of ten shillings a week, a state of affairs that called for a great deal of pioneer work which the Association had splendidly carried out. In this connection he paid tribute to the labours of Messrs. Lunn, Parker, Heslop, Jones, Thomas and Oswald, among others. The policy of the Association was based upon Whiteleyism and all that it meant, the enthronement of reason as against "hot-headedness" and strikes. Such a policy could not fail to receive public support. Loyalty to the Executive was a factor of success, and he predicted a great future for the E.P.E.A. Touching upon unemployment, Mr. Page said there was no remedy, and the only possible palliative was that each industry should take care of its unemployed. He hoped that now that the Institution of Electrical Engineers had received its Charter, all situations in the industry worth having would be reserved for its members. He congratulated the Association upon its journal, which he thought

was capable of doing valuable work. With regard to the proposed agreement with the E.T.U., he supposed that something of the sort was unavoidable, but he warned the members not to sell their birthright and to still retain the right to stand aside if they considered any issue not just. The speaker was glad to observe that, notwithstanding the existing industrial depression, the output of the country's power stations was increasing. Prospects were very bright; the domestic side of supply had hardly been touched, and large railway electrification schemes were being projected. The task of the Electricity Commissioners was not an easy one, and they depended entirely upon the confidence of the industry. They had been endowed with superhuman powers to institute a "cheap and abundant supply of electricity," but if the Association increased the supply of competent engineers, their task would be lightened and the Association would justify its existence.

Mr. W. J. Jeffery, in a humorous speech, proposed the health of "The Ladies," and hoped that he would soon see lady members of the Association.

Mr. W. J. Oswald then proposed the toast of "The Visitors." He first mentioned the National Executive Council, and explained that as a member of that Council he was in a peculiar position, and could neither praise nor blame. The policy of the Association was formulated by Mr. Lunn, and that policy was still in force. He voiced the members' appreciation of the presence of Mr. Page, and said that the Association could do a great deal in co-operation with the Commissioners to benefit the industry. The Commissioners were sorely handicapped by political interference, but they were overcoming all obstructions. The electrical industry should not be a pawn in national or local politics. He deprecated the "Be-good-boys-and-carry-on" attitude of the chief engineers when the E.P.E.A. was formed, and he felt that to make the movement a complete success the Association should embrace everybody in the profession from the "chief" to the shift engineer. The speaker expressed his appreciation of the work done by the National Joint Board, and spoke of the reasonable attitude adopted by the majority of employers. He asked for the support of contractors and manufacturers to the Association's efforts to develop the technical side of the industry.

Mr. J. H. Heslop then made a presentation of a gramophone, a clock and a wristlet watch to Mr. and Mrs. Parker. He said that Mr. Parker was the finest man he had ever met, and had rendered inestimable services to the Association. Mrs. Parker, too, had sacrificed her husband to their cause. It was largely due to Mr. Parker's patience and persistence that the Schedule had been adopted all over the country. Messrs. Thomsen, Oswald, and Lunn associated themselves with the testimony of Mr. Heslop. Mr. Parker briefly thanked the members for their gifts, and desired the credit to be spread over the whole of the N.E.C. and the Emergency Committee.

Responses to the toast of "The Visitors" were made by Messrs. W. Wyld and A. L. Lunn, and Mrs. Parker responded for the ladies in a few well-chosen words.

Mr. Heslop, the newly-elected President, then answered for the Association. Speaking of the difficulties encountered by the Electricity Commissioners, he remarked that the Electricity (Supply) Act had been framed first for the benefit of the lawyers and then for that of the community. He assured the Commissioners that they would have the aid of the E.P.E.A. in all their undertakings. The agreement with the E.T.U. was imperative. The manual workers had similar problems to their own, and mutual support was essential. To call it an "E.T.U." agreement was a misnomer, for it was an arrangement they wished to make with all associated unions, as well as the Chief Engineers' Association. Mr. Heslop claimed that the fact that there had been no serious stoppage of supply in this country was due largely to the Association's influence. The E.P.E.A. intended to exert all its efforts to secure the retention of the wage boards, and they were glad that they had the Commissioners' support in this direction. Regarding unemployment, he said that there were always depreciation and renewal funds for plant, but nothing of the kind for labour. This should not be; employers should not be permitted to use labour for as long as it suited them and then cast it off. He hoped that employers would soon realise their responsibility in this regard.

Interspersed with the toasts and responses were a number of excellent concert items, rendered by the Misses Hunt, Miss Betty Bunch, Miss Marie Fien and Messrs. Rayson-Cole and Jack Walker.

THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.

Annual Festival Dinner.

On Wednesday last week the annual Festival Dinner of this Institution was held at the Trocadero Restaurant; Sir Tom Callender, J.P., presided, and for the first time the presence of ladies graced the proceedings. Amongst those present were Lady Callender, Sir William and Lady Noble, Mr. and Mrs. Ll. B. Atkinson, Mr. W. W. Lackie, Mr. G. Sutton, Mr. J. Y. Fletcher, Lt.-Col. H. M. Leaf, Capt. R. J. Wallis-Jones, Mr. P. V. Hunter, Dr. H. F. Parshall, Mr. W. A. Chamen, Mr. E. W. Monkhouse, Mr. and Mrs. W. B. Esson, Mr. and Mrs. R. W. Hughman, Mr. H. Bevis, Mr. H. H. Berry, and many other well-known supporters of the Institution.

After the loyal toast, the president said that letters regretting inability to attend had been received from Sir David Salomons (president of the Institution), Mr. H. J. Cash, Dr. S. Z. de Ferranti, Mr. H. Hirst, Mr. E. Manville, M.P., and many other friends.

Introducing the toast of "The Electrical Trades Benevolent Institution," Sir Tom Callender said that it was established with the primary object of granting pensions to necessitous persons, and the fact that so far no occasion had arisen for that purpose spoke well for the electrical industry. But the day would surely come when pensions would be called for, and they were endeavouring while the sun shone to provide for the rainy day. Up to the present the funds amounted to £15,700—a nice beginning, bringing in £700 a year, which met the expenses and helped to swell the total. The Institution also gave allowances in deserving cases; this year they amounted to £52—which again spoke well for the industry. No worthy case was turned away. The benevolent fund of the I.E.E. was applicable only to members of that Institution; theirs applied to persons who were deeply interested in the industry—members of staff, managers, &c. The two Institutions worked hand in hand without clashing of interests, one usefully supplementing the other. Appealing to the audience with confidence to add to the list of donors, Sir Tom invited the vice-chairmen, Sir William Noble and Mr. Ll. B. Atkinson, to support his appeal.

Sir William Noble, remarking that the department of which he was the head was one of the best customers of the electrical trades, said that as a civil servant he was entitled to a pension, as were his colleagues, but he knew a great deal about benevolent institutions, for they were necessary even in Government service. After citing instances in point, he said that in 1907 he called a meeting of the staff of the London district (of which he was then in charge), and a benevolent fund was formed, which had done a great deal of good. Some 85,000 Post Office officials joined the Forces in the war, and the Post Office Relief Fund was formed in 1914, which between that time and 1918 raised nearly £450,000; 9,000 men were killed and many thousands wounded, and the fund, which maintained two hospitals and three convalescent homes, provided for the needs of the widows and orphans, and sent a parcel to every prisoner of war every week. There were still 3,000 widows and 5,000 children on its books, and many of the orphans were educated and maintained by the fund.

Mr. Ll. B. Atkinson, expressing his pleasure in supporting everybody's friend—Sir Tom Callender—drew a parallel between the vicissitudes through which the individual passed and those which the industry itself had experienced within a year. Last year trade was booming—now it was in the trough of depression; they ought to have large funds, but no one had any money. They should learn a lesson from that instance of the unexpected changes that might take place in the career of anyone, and to exert every effort now to build up the funds. The engineering trades were carried on largely by big companies which had their own pension and relief funds, and these kept many cases off the funds of the E.T.B.I., so that the small payments made did not represent the real proportion of casualties. That night ladies were present for the first time; "charity begins at home," and as they had brought the best part of their homes with them, the conditions were favourable to the success of the fund.

Mr. Lee Matthews proposed the toast of "The Ladies," to which Lady Callender responded, remarking that she was not sure the invitation was disinterested; no doubt the ladies would use their influence with their husbands on behalf of that worthy fund, and she hoped there would be a splendid response.

Mr. J. Y. Fletcher pointed out that previously they had always met when unemployment was low—that day it was at its maximum, and they were certain to receive calls for aid. Hence they were especially grateful to Sir Tom Callender, whose presidency would ensure a result otherwise unattainable. He proposed the health of Sir Tom, which was accorded musical honours. Returning thanks, Sir Tom Callender expressed his indebtedness to the able assistance of the hon. secretary, Mr. Hawes, and announced the result of the Festival—£410 13s.—which with the amount collected made a total of £1,280, and would be brought up to more than £1,300 before the list was closed.

Sir Tom proposed the health of Mr. F. B. O. Hawes, whose onerous duties carried nothing with them but hard work, and Mr. Hawes, in reply, expressed the great pleasure it had given him to work for the Institution during the past 12 years. The total income when he began was 50 per cent. less than the income from investments now, but £15,000 was not nearly adequate—the fund ought to be 10 times as great. However, they could not but be satisfied with its steady growth.

During the evening musical entertainment was provided by Miss Violet Openshaw, Mr. Edward Dykes, and Mr. C. T. Sterndale Bennett, accompanied by Mr. Bernard Flanders, A.R.A.M. The function ranked as one of the most successful in the history of the Institution.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A 10-ton Pulley Drawer.

The work of taking pulleys off shafts is, as a rule, a troublesome business, and consequently many ingenious devices are employed to get over the difficulties encountered. Most of these are "rigged up" for the special occasion, but the Automatic Machinery Co., 28, New Union Street, Ancoats, Manchester, has recently introduced an appliance for the purpose which should prove a valuable addition to the equipment of the machine shop or other establishments in which keyed pulleys are employed. This is the "Rightway" drawer (fig. 1), which has a pull of ten tons simply applied. It consists of three equidistant bars fitted into a central block through which passes a thrust bolt. These bars are serrated, and in the indentations fit the links of chains upon the ends of which are claws. These claws are attached to the rear face of the pulley, while the pull is applied by means of the thrust bolt, and is evenly distributed. If the pulley is held

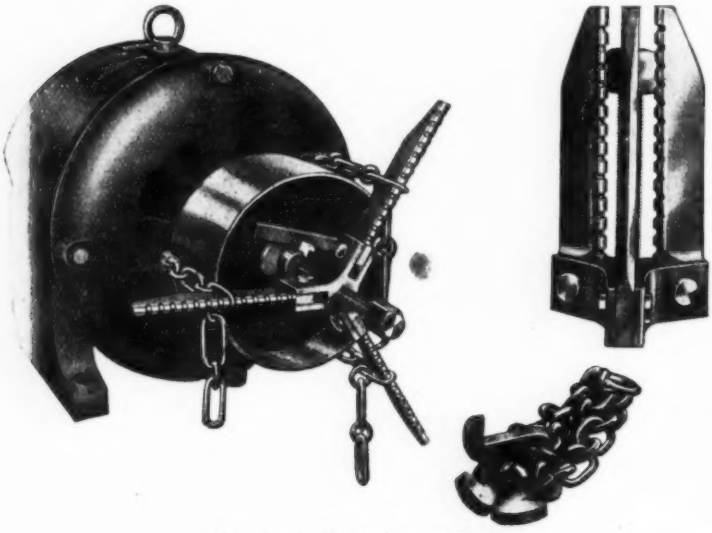


Fig. 1.—A 10-ton Pulley Drawer.

by a gib-headed key, a metal bar can be inserted, as shown in the illustration. The serrated bars are so fitted that they can be folded up into a small space when the appliance is not in use, as shown in the figure.

Porcelain Handles with Quick-Break Links.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., have recently put on the market a very useful form of quick-break disconnecting link, consisting of a copper link fitted with an auxiliary blade or flicker at both ends, the whole being mounted in a heavy porcelain carrier which is interchangeable with the well-known shrouded fuse carriers manufactured by this company. The arrangement provides a simple means of disconnecting under load, where it is impossible to use quick-

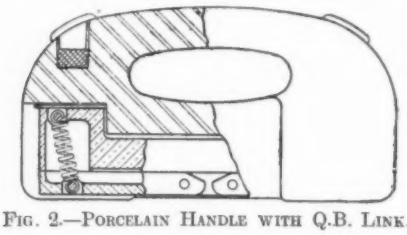


Fig. 2.—Porcelain Handle with Q.B. Link.

break knife switches owing to a lack of space, as, for instance, in feeder pillars and sub-stations, where the saving of space is an important item. These patent quick-break disconnecting links can be supplied from stock in all sizes from 60 A to 500 A for use on 500-V circuits. Messrs. Henley's are prepared to send a complete sample link for demonstration purposes to any engineer interested.

The "Airolite" Power Set.

Messrs. P. & W. MacLellan, Ltd., Clutha Works, Glasgow, have put on the market their "Aerolite" plant for the utilisation of wind power for the generation of electricity. This set (fig. 3) consists of a circular wind turbine 14 ft. in diameter, mounted on a tower, driving a dynamo through suitable gearing. This dynamo is wound to give a constant voltage under varying wind velocities. An accumulator battery forms part of the set, and an automatic switchboard maintains the charge or cuts the battery out as necessary. The capacity of the battery is 120 Ah. The dynamo has an output of 30 A at a pressure of 50 V.

A governor is fitted which throws out the driving gear should the wind velocity be too high.

Fig. 3.—The "Airolite" Power Set.

This set would seem to provide an economical means of generating electricity for isolated buildings where the wind power is sufficiently great to drive the dynamo for about eight hours a day.

A New Method of Shop Window Lighting.

At night, when all the windows in a locality are similarly lighted, individual distinction is apt to be submerged in the collective brilliance. In colour, however, lies the salvation

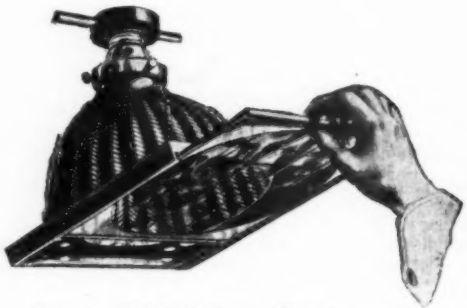


Fig. 4.—B.T.H. X-Colour-Ray Attachment.

of the lighting individualist. The judicious use of coloured illumination can be made to emphasise the message and purpose of a display flooded with a warm amber light. A window enhances the appearance of the goods displayed.

Nobody will dispute the psychological value of coloured lighting, and now a device has been introduced whereby the efficient illumination of shop windows by means of colour slides may be effected.

This device is the "X-colour-ray" attachment, which both in design and construction is the essence of simplicity. The attachment consists of frame, slide, and colour medium. The frame fits over a "Jove" or "Jupiter" "X-ray" reflector, and is attached to the latter by means of four hooks which fix

in the ventilation holes. The slide is made to hold the gelatine colour medium (the only medium that does not rapidly fade) supporting it by means of fine steel wires. Red, amber, blue, and green are the standard colours provided, and an important feature of the attachment is that the colour of the lighting can be changed in a few seconds by the substitution of one slide for another (fig. 4). Thus the trader is able to alter the appearance of his display as often as he likes. The contrivance can be placed in position without the aid of any tools, and the metal part of the frame in no way interferes with the lighting effect. When the ordinary white light is required, it is not necessary to remove the frame; only the slide need be taken out. Ample ventilation is provided and fire risks are entirely obviated. At least one of the largest London stores has already installed the "X-colour-ray" attachment with complete success. Further information can be obtained from the British Thomson-Houston Co., Ltd., 77, Upper Thames Street, London, E.C. 4.

REVIEWS.

Electric Motor Installations: Their Upkeep and Lay-out. (The Vulcan Engineering Manuals.) Pp. 112; 65 figs. Manchester: Vulcan Boiler & General Insurance Co., Ltd. Price 2s. 6d. net.

This manual, according to the introduction, is intended to be a guide for users and prospective users of electrical machinery to: "(1) The class and type of motor and accessories to be installed in various cases. (2) The attention required." Further, it is considered necessary "to explain the general principles and to define the various terms used in common practice."

The work is divided into eleven chapters, the first two consisting of elementary electricity and magnetism including hydraulic analogy and some general constructional details. Similar matter has existed since Victorian days in countless text and pocket books and in trade "literature." The latter half of the second chapter discourses on the H.O. regulations, and finishes by inviting the reader to study them for himself.

In Chapter 3 four pages are taken up by explaining what a starter is, how it works, and how to use it, half a page is given to speed regulation, and the same amount of space to earthing, or, rather, bonding, as earthing is not mentioned.

Chapter 4 consists of five pages, boiling down to: Choose the right size and type of motor, keep it clean and dry, don't use too much oil or let the bearings wear low.

Chapter 5 is given up to d.c. breakdowns, some good photographs being reproduced. If the machines described were inspected regularly, it looks as if four of the breakdowns could have been avoided.

Chapters 6 and 7 are on somewhat similar lines to the first two chapters, but deal with a.c. The statement that the single-phase repulsion induction motor is not now generally made is incorrect. This type of motor is made by several firms, and is in many respects the finest single-phase machine obtainable.

The next two chapters deal with starting and speed regulation respectively, the subject being dealt with in a general and discursive manner. Two-phase starters are not mentioned. A pulley combined with a clutch is shown, but no information is given as to how it works.

Chapter 10 is devoted to breakdowns of a.c. motors, the photographs showing typical troubles as clearly as it is possible to do so.

The book concludes with five pages on the lay-out of a motor installation. The chief item is the suggestion for finding the size of motor required—namely, to install a temporary machine and take readings.

The title of the manual is misleading as, apart from the chapters on breakdowns, the photographs therein speaking louder than words, it is largely made up of elementary principles and generalities.

The problems connected with the lay-out and operation of electric motor installations are hardly touched upon.

A number of the illustrations and a portion of the text appeared in a small handbook, issued by the same company some years ago.—E. F.

Foreign Trade Tables. By A. J. Lawson, M.Inst.C.E. Third edition. Pp. xviii+561. London: Thomas Skinner and Co. Price 21s. net.

In our issue of May 17th, 1918, we reviewed the first edition of Mr. A. J. Lawson's tables of metric weights and measures and British equivalents, which was then a book of 200 pages, and was published at 5s. net; we now welcome the third edition, revised and trebled in size, and under a new title. Its sub-title is "Metric Weights and Measures and British Equivalents, Engineering Data, Prices in British and Foreign Moneys, Exchange, Gold Standards and Currencies, Interest, Depreciation." The book is issued by the British-Italian Corporation, Ltd., whose managing director, Mr. George Manzi Fè, draws attention to the loss of trade which results from our adherence to complicated non-decimal currency and weights and measures; he points out that the British trader can send a copy of this work to his foreign customer, to enable him to convert British quotations into his own units at the current rate of exchange; or he can quote to the foreigner in the latter's own currency at gold par exchange by mere inspection of one table. Moreover, the author has decimalised the pound and compiled tables which give prices from ¼d. to £10 for each unit of measurement, so that one "*can read direct from these tables the corresponding prices at gold par per metric unit in each of a number of foreign currencies,*" which can be converted by simple multiplication with a factor in another table into "*the price at any rate of exchange.*" New tables give equivalent prices in European, Eastern, and Latin-American currencies for metric weights and measures corresponding to British prices for British weights and measures, enabling users to quote prices directly from the tables without calculation; other new tables give reciprocal values of British and foreign moneys at any rate of exchange.

This remarkable volume represents an enormous amount of labour; in addition to compiling the new tables, the author has again checked the figures in the existing tables. The full significance of this remark can only be gained from a perusal of the pages, containing a mass of items which in many cases run to nine significant figures. In a concluding paragraph he says: "It has involved long and careful research, much computation and difficulty of arrangement in proper sequence and convenient form, added to which, troubles of eyesight have made proof-reading at times a painful ordeal. But on the whole it has been a labour of love . . .," and in congratulating him upon the excellence of the achievement, we tender our sympathy in respect of the physical handicap under which he has laboured.

This volume is by far the most comprehensive work of its kind that we have met with. Every need that can be foreseen has been provided for. For example, after tables giving interest on capital from 1 to 10,000 (pounds or other monetary units) at rates varying from ¼ to 10 per cent. by eighths, a table is given of multipliers for the reduction of interest per annum to interest for any required number of days; and a separate table is given for leap years. Another table gives the number of days between any two dates in a year. The same precision and forethought are characteristic of the rest of the contents. The price tables cover the majority of currencies of interest to traders. Conversion tables for apothecaries' weights and measures, and a variety of engineering tables and data are given. The more we study the book, the more we are impressed with its scope and value. Many examples illustrating the uses of the tables are given in the text, together with a wealth of information of a descriptive, critical, or explanatory nature. The author outlines the position regarding the adoption of decimal coinage in this country, and points out that the penny has completely lost its standing as the coin alleged to be the most widely used and the most dangerous to alter. In a lengthy appendix a great variety of information on subjects relating to British trade and finance is given, which alone would deserve a detailed review. The book is one which ought to find a place at the hand of every manufacturer, merchant, or banker interested in trade with overseas countries.

The Electrical Handling of Materials. A manual in four volumes on the design, construction, and application of cranes, conveyors, hoists, and elevators. Vol. II.—Structural work. By H. H. Broughton, M.Inst.M.E., M.I.E.E., &c. Pp. xvi + 292; 358 figs. London: Benn Brothers, Ltd. Price 25s. net.

This book, as we are told in the preface, is a revised edition of the author's book on "Electric Cranes and Hoists," and with the exception of the sections devoted to cranes the whole of the matter is new. Vol. I deals with electrical equipment. Vol. II deals with structural steelwork and mechanical equipment (the present volume), while cranes and crane mechanism are considered in Vol. III, and the machinery used in the mechanical handling of materials, and the methods of handling and storing materials in Vol. IV.

The present work deals with structural steelwork in the first three chapters, covering one-third of the book, while the remaining two-thirds is divided into another 15 chapters devoted to spur and worm gearing, gear arrangements, variable speed transmission gear, transmission chains, axles, bearings, lifting tackle, winding drums, brake gear, &c., and judging by the present book, the whole work must be a tremendous undertaking. It is a very practical collection of formulæ, data, and tables, interspersed with worked-out examples showing the use of the formulæ, which will prove of great assistance to the student in this class of work, a great feature being the graphical diagrams of stresses. No attempt is made to deal with the theory of the strength of materials, or the elements of machine design, but the authority or source of the formulæ is quoted in all cases. The book is also well illustrated, with a number of folding plates showing details of structural work and equipment taken from actual practice, and generally the book is thoroughly up to date, and will be found a most useful work for those engaged or interested in this important branch of engineering.

NEW PATENTS APPLIED FOR, 1921.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEPTON-JONES, O'DELL AND STEPHENS, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

27,335. "Arrangement of magneto in cycle auxiliary motors." Motorenfabrik Oberursel Akt.-Ges. October 14th. (Germany, February 12th.)
27,337. "Key contacts for electrically-operated organs, &c." J. H. Compton and F. A. Musgrave. October 14th.
27,344. "Inert electric batteries." Ever-Ready Co. (Great Britain), Ltd., and C. S. Mummery. October 14th.
27,346. "Electromagnetic chucks." W. Zehnder. October 14th. (Switzerland, October 16th, 1920.)
27,355. "Devices for suspending cables, ropes, pipes, &c." M. Elder and W. M. Elder. October 14th.
27,356. "Field magnets for magneto electric generators, dynamos, &c." Combination Metallic Packing Co. (1921), Ltd., and E. Harrison. October 14th.
27,357. "Dynamo electric machines." Combination Metallic Packing Co. (1921), Ltd., and E. Harrison. October 14th.
27,358. "Armatures of magneto-electric generators." Combination Metallic Packing Co. (1921), Ltd., and E. Harrison. October 14th.
27,359. "Magnetos, &c." Combination Metallic Packing Co. (1921), Ltd., and E. Harrison. October 14th.
27,360. "Apparatus for making communication secret in wireless telegraphy and telephony." E. P. Brown. October 15th.
27,365. "Contrivance for generating electrical energy." L. E. Norton. October 15th.
27,367. "Supports, &c., for electric conductors." J. W. Harris and A. Wiseman. October 15th.
27,379. "Telephones operated by heat." L. B. Miller. October 15th.
27,407. "Means for producing high-frequency oscillations for transmitting messages, &c." W. E. E. Habann. October 15th.
27,433. "Electric lamps for vehicles." R. R. Sprosen and S. Wiseman. October 15th.
27,435. "Relay circuit arrangements for telephones, &c., systems." Automatic Telephone Manufacturing Co., Ltd. October 15th. (United States, November 17th, 1920.)
27,437. "Three-phase induction motors." H. Koch and F. Schwarz. October 15th.
27,464. "Adjustable electrical contacts." I. H. Parsons. October 17th.
27,484. "Electrical switchgear for automobiles." B. S. Woodmancy. October 17th.
27,493. "Magneto spark control." E. A. Clements. October 17th.
27,497. "Electric indicators." E. L. M. Emtage. October 17th.
27,504. "Electrical or mechanical advertising apparatus." J. M. de Vries de Waal. October 17th.
27,512. "Electric incandescent lamps, &c." Naamlooze Vennootschap Metaaldraadlampen fabriek Holland. October 17th. (Holland, July 29th.)
27,519. "Electric welding devices of the resistance type." W. J. Rickets. October 17th.
27,522. "Electric model and toy apparatus, &c." R. L. Monger and J. Ruler West. October 17th.
27,527. "Cooling dynamo electric machines." J. C. Todman and Todman, Ryall & Co., Ltd. October 17th.
27,528. "Dynamo-electric machinery." J. C. Todman and Todman, Ryall and Co., Ltd. October 17th.
27,529. "Brush gear for dynamo-electric machines." J. C. Todman and Todman, Ryall & Co., Ltd. October 17th.
27,533. "Starting devices for three-phase short-circuited motors." Bergmann Elektricitats-Werke Akt.-Ges. October 17th. (Germany, October 25th, 1920.)
27,538. "Protected electric switches." J. Hall and New Switchgear Construction Co., Ltd. October 17th.
27,546. "Electric motors." M. W. Woods. October 17th.
27,549. "Accumulator and secondary battery plates." C. W. Jenner and Siebe and Gorman & Co., Ltd. October 17th.
27,550. "Electric alarms." C. Muller. October 17th. (Germany, July 4th.)
27,561. "Telephone systems." Siemens & Halske Akt.-Ges. October 17th. (Germany, October 16th, 1920.)
27,575. "Automatic electro-magnetic lock for railway carriage doors, &c." A. Crankshaw and T. Markland. October 18th.
27,599. "Suspension of filaments in vacuum tubes, &c." Mullard Radio Valve Co., Ltd., and S. R. Mullard. October 18th.
27,617. "Measuring resistances, &c." M. Coppee. October 18th.
27,620. "Electric lamps, &c." A. Oppenheimer. October 18th.
27,622. "Trolley collectors for electric tramcars or motor vehicles." E. P. B. Estler, H. P. C. Estler, P. T. J. Estler, and Estler Bros. October 18th.
27,636. "Alternating current protective devices." K. Edgcumbe and E. I. Everett. October 18th.
27,639. "Brakes of tramcars, &c." English Electric Co., Ltd. October 18th.
27,651. "Electric switches, &c." P. Speedy and Speedy & Eynon. October 18th.
27,665. "Electrical actuating means for type bars of typewriters, &c." A. E. White (Magnetic Power Transmitter Co.). October 18th.
27,668. "Systems of illumination." British Thomson-Houston Co., Ltd. (General Electric Co.). October 18th.
27,674. "Stand for electric irons." W. Hodgson. October 18th. (New Zealand, October 29th, 1920.)
27,677. "Electric switches, &c." G. Ellison. October 18th.
27,678. "Electric switches, &c." G. Ellison. October 18th.
27,683. "Manufacture of electrodes." S. R. Illingworth. October 18th.
27,689. "Telephone systems." J. E. Pollak (Siemens & Halske Akt.-Ges.). October 18th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1920.

9,670. "Permanent magnets and permanent magnet motors." S. I. Hitchcock. April 6th, 1920. (169,735.)
12,439. "Electrically driven winches." W. H. Scott. May 5th, 1920. (169,744.)
14,998. "Electrically heated tubes, muffles, and the like." Morgan Crucible Co., Ltd., and G. I. Payne. June 2nd, 1920. (169,756.)
15,206. "Electric lamps particularly adapted to be carried or supported on the person." G. Oldham and J. Oldham. June 4th, 1920. (Cognate application 29,436, 1920.) (169,761.)
15,223. "X-ray plant." G. Hubers. April 8th, 1916. (Addition to 144,318.) (144,319.)
16,980. "Two-phase high-frequency electric alternating-current generators." M. C. A. Latour. June 23rd, 1920. (Patent of addition not granted.) (169,767.)
16,999. "Arrangement for controlling the length of conversations for telephone or the like purposes." Automatic Telephone Manufacturing Co., Ltd., P. T. Bates, and A. V. Newell. June 23rd, 1920. (169,768.)
17,123. "Locking devices for electric and other hoists." J. Barker & Sons, Ltd., and J. Saxton. June 24th, 1920. (169,772.)
17,135. "Method of electrically welding steel." J. W. Plant. June 24th, 1920. (169,773.)
17,558. "Manufacture of electric heaters." J. Gyuris. August 22nd, 1919. (150,673.)
17,857. "Electro-magnetic wave-receiving arrangements." Ges. fur Drahtlose Telegraphie. May 6th, 1918. (145,629.)
17,947. "Vacuum electric discharge apparatus." Siemens Schuckertwerke Ges. August 13th, 1915. (145,676.
17,948. "Anodes for vacuum electric discharge apparatus." Siemens Schuckertwerke Ges. October 29th, 1915. (Addition to 145,676.) (145,677.)
17,986. "Automatic maximum electric switches." J. V. Balsley and A. Thode. December 15th, 1917. (145,698.)
18,020. "Apparatus for the transmission of rotary movements from a distance with synchronously acting transmitter and receiver." F. Krupp Akt.-Ges. July 26th, 1916. (145,722.)
18,057. "Sparking plugs." A. Chambers. July 2nd, 1920. (169,787.)
18,074. "Holders for electric incandescent lamps." L. B. Codd and C. Martin. July 2nd, 1920. (169,788.)
18,097. "Electric insulators." Ohio Brass Co. May 29th, 1916. (145,755.)
18,154. "Electrodes for vacuum electric discharge apparatus." Siemens Schuckertwerke Ges. December 7th, 1918. (Addition to 145,676.) (145,778.)
18,313. "Electric amplifiers." Siemens & Halske Akt.-Ges. July 7th, 1916. (146,353.)
18,316. "Electric arc welding apparatus." E. C. R. Marks (Siemens Schuckertwerke Ges.). July 2nd, 1920. (Convention date not granted.) (147,554.)
18,322. "Thermionic vacuum tubes." E. R. Stockle. June 13th, 1917. (146,357.)
18,387. "Electrically-operated switch machines for railways." W. H. Simms (General Railway Signal Co.). July 2nd, 1920. (169,795.)
18,641. "Telephone systems." Western Electric Co., Ltd. June 14th, 1919. (146,517.)
18,656. "Methods of an apparatus for radio signalling." Radio Corporation of America. January 6th. 1916. (146,532.)
18,658. "Apparatus for dealing with feeble electric impulses as in wireless telegraphy." Radio Corporation of America. February 24th, 1915. (146,534.)
18,659. "Receivers of electrical oscillations." Radio Corporation of America. April 25th, 1914. (146,535.)
18,661. "Thermionic valves." Radio Corporation of America. March 10th, 1917. (146,537.)
18,751. "Electric lamps, particularly those for motor vehicles." Compagnie Générale d'Electricité. February 4th, 1919. (146,864.)
18,786. "Automatic distant control of hydro-electric and other machinery." L. F. Haines. July 6th, 1920. (169,812.)
18,838. "Method of detecting the effects induced by alternating currents flowing through conductors laid in fairways for vessels." Siemens & Halske Akt.-Ges. December 18th. 1918. (146,903.)
18,909. "Electrical resistances of the thermionic type." J. Erskine Murray. July 6th, 1920. (169,817.)
18,938. "Protective devices for electric alternating current distribution systems." H. A. Carney, J. H. Bowden, H F. J. Thompson, and Johnson and Phillips, Ltd. July 6th, 1920. (169,818.)
18,967. "Method for reducing the overtalking and overhearing in long-distance two or four-wire circuits." Siemens & Halske Akt.-Ges. March 22nd, 1919. (147,013.)
19,020. "Galvanic batteries and electric safety lamps." R. Ziegenberg. July 6th, 1920. (169,822.)
19,068. "Sparking plugs for igniting gaseous matter in internal combustion engines." G. H. Ward and H. F. Tierney. July 7th, 1920. (169,823.)
19,271. "Electric arc welding." Rail Welding & Bonding Co. January 26th, 1920. (158,215.)
19,337. "Wireless telegraph transmitters." Ges. fur Drahtlose Telegraphie. October 20th, 1917. (147,434.)
19,379. "Electro-magnetic wave transmission systems." Soc. Francaise Radio Electrique. July 9th, 1919. (147,465.)
19,809. "Art of armature construction." V. G. Apple. February 14th. 1918. (147,781.)
19,866. Brush shifting apparatus for alternating current electric motors." British Thomson-Houston Co., Ltd. February 13th, 1918. (147,821.
19,879. "Method of and means for manufacturing electric incandescent lamps." F. Gross. June 29th, 1920. (147,831.)
19,886. "Multiplex telephony." Ges. fur Drahtlose Telegraphie. December 14th, 1918. (147,837.)
20,004. "Secret combination electric selecting or like devices." A. Cohn. Sen (firm of). April 22nd, 1919. (147,949.)
20,036. "Electron discharge apparatus." British Thomson-Houston Co., Ltd. December 29th, 1913. (148,134.)
20,226. "Telephony." Dr. E. F. Huth Ges. and S. Loewe. December 31st, 1915. (148,312.)
20,229. "Aerial conductors for wireless telegraphy and winding apparatus therefor." Dr. E. F. Huth Ges. July 1st, 1915. (148,315.)
20,233. "Reels and the like for winding and unwinding aerial conductors." Dr. E. F. Huth Ges. May 16th, 1918. (148,319.)
20,322. "Insulators." R. M. Johnston. July 9th, 1920. (169,834.)
20,323. "Insulators." R. M. Johnston. July 9th, 1920. (169,835.)
20,343. "Methods and circuit arrangements for generating pure continuous electric currents by means of machines." C. Lorenz Akt.-Ges. and K. Schmidt. February 13th, 1919. (148,401.)
20,355. "Submarine sound receiving devices." Signal Ges. September 8th, 1915. (Addition to 147,936.) (148,410.)
20,370. "Electro magnetic vibratory devices." Signal Ges. July 12th, 1915. (148,423.)
20,372. "Laminated iron cores in sound apparatus." Signal Ges. February 17th, 1916. (148,425.)
20,399. "Multiplex telephony." Ges. fur Drahtlose Telegraphie. May 27th, 1919. (Addition to 147,837.) (148,444.)
20,507. "Antenna systems for receiving electric waves." Ges. fur Drahtlose Telegraphie. June 18th, 1918. (148,530.)
20,600. "Spark plug." Champion Ignition Co. March 8th, 1917. (148,777.)
20,710. "Sparking plugs." Soc. International Pour l'Exploitation de la Bougie Sol. March 5th, 1918. (148,887.)
21,179. "Three-electrode ionic tubes." J. Ree, Radio Communication Co., Ltd., and L. B. Turner. July 13th, 1920. (Addition to 139,867.) (169,845.)
21,450. "Wireless directional transmission and reception apparatus." T. H. Hill. July 16th, 1920. (169,849.)
21,596. "Driving of magneto ignition apparatus for internal combustion engines." M. S. Conner and C. C. Puckette. July 19th, 1920. (169,853.)
21,598. "Signalling devices for street crossings of tramways and the like." R. Zellweger and E. Zellweger. July 19th, 1920. (169,854.)
24,688. "Vacuum tube devices, especially such devices in which an electron current is controlled by a magnetic field." British Thomson-Houston Co., Ltd. (General Electric Co.). August 25th, 1920. (169,889.)
26,273. "Automatic electric circuit breakers." E. F. Moy and P. H. Bastie. September 13th. 1920. (169,899.)
26,913. "Electric lamp holders." A. H. Hunt and J. W. Goddard. September 21st, 1920. (169,904.)
28,094. "Electric insulators and their manufacture." H. Herrmann. June 4th, 1920. (164,298.)
31,233. "Electrical transformers." Metropolitan-Vickers Electrical Co., Ltd. (Westinghouse Electric & Manufacturing Co.). November 4th, 1920. (169,915.)

1921.

946. "Galvanic battery." E. Wilke. December 10th, 1919. (157,097.)
8,384. "Means for fixing electric cables and wires." F. C. Raphael and Edison Swan Electric Co., Ltd. November 22nd, 1920. (Divided application on 32,934, 1920.) (169,936.)
11,120. "Means for reducing the ground current in electric high-tension transmission systems." Allmanna Svenska Elektriska Aktie-Bolaget. April 16th, 1920. (161,954.)
13,768. "Construction of corrugated paper package for electric lamps and other objects." G. Sutre. July 20th, 1920. (166,880.)
20,861. "Oil cooled transformer boxes." Akt.-Ges. Brown, Boveri et Cie. August 5th, 1920. (167,496.)